

*From Warner & Swasey*

# CATALOGUE

**Optical, Physical, Astrophysical and  
Astronomical Instruments**



... 1911 ...

**JOHN A. BRASHEAR COMPANY, LTD.**

**PITTSBURGH, N. S., PENNA., U. S. A.**



Works of the John A. Brashear Co., Ltd.

# CATALOGUE

OPTICAL, PHYSICAL, ASTROPHYSICAL  
—AND—  
ASTRONOMICAL INSTRUMENTS



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# INTRODUCTION



It is a very difficult, indeed, an almost impossible task, to publish a comprehensive Catalogue of the various types of Optical, Physical, Astrophysical and Astronomical Instruments made by us. . . . For nearly thirty years we have been engaged almost wholly in constructing instruments of precision for original research, and our work is so well known throughout the scientific world that a complete descriptive Catalogue is fortunately not required. . . . Besides this, almost every physicist and astronomer desires to engage in some line of research requiring a special adaptation of the instrument he proposes to use, so that what is illustrated today may not be suitable for the work of tomorrow; and it is only by correspondence or a personal visit to our works that exact data can be determined upon. . . . It is the aim of our firm to produce high grade apparatus, especially in optical lines. We have associated with us Dr. Chas. S. Hastings, of the Sheffield Scientific School of Yale University, who computes all visual, spectroscopic and photographic lenses, and we are thus enabled to give the very best results obtainable. . . . The illustrations in this Catalogue are from photographs of instruments made by us and in actual use. The prices given are for standard instruments and apparatus. In some cases, however, it is impossible to give the cost of a special instrument until the desires of the purchaser are known; therefore we cordially invite correspondence, and should any of our patrons desire to make us a personal visit, they will be made welcome. . . . .



## Price List of Achromatic Objectives for Telescopes, Spectroscopes, Etc.

|     |             |                              |    |        |
|-----|-------------|------------------------------|----|--------|
| 2   | inches..... | clear aperture, in cell..... | \$ | 20     |
| 2.5 | " .....     | " .....                      |    | 30     |
| 3   | " .....     | " .....                      |    | 50     |
| 3.5 | " .....     | " .....                      |    | 70     |
| 4   | " .....     | " .....                      |    | 100    |
| 4.5 | " .....     | " .....                      |    | 125    |
| 5   | " .....     | " .....                      |    | 175    |
| 5.5 | " .....     | " .....                      |    | 225    |
| 6   | " .....     | " .....                      |    | 325    |
| 6.5 | " .....     | " .....                      |    | 400    |
| 7   | " .....     | " .....                      |    | 500    |
| 7.5 | " .....     | " .....                      |    | 600    |
| 8   | " .....     | " .....                      |    | 700    |
| 8.5 | " .....     | " .....                      |    | 800    |
| 9   | " .....     | " .....                      |    | 900    |
| 9.5 | " .....     | " .....                      |    | 1,000  |
| 10  | " .....     | " .....                      |    | 1,125  |
| 11  | " .....     | " .....                      |    | 1,500  |
| 12  | " .....     | " .....                      |    | 2,000  |
| 13  | " .....     | " .....                      |    | 2,575  |
| 14  | " .....     | " .....                      |    | 3,200  |
| 15  | " .....     | " .....                      |    | 3,800  |
| 16  | " .....     | " .....                      |    | 4,800  |
| 18  | " .....     | " .....                      |    | 6,900  |
| 20  | " .....     | " .....                      |    | 9,400  |
| 22  | " .....     | " .....                      |    | 11,500 |
| 24  | " .....     | " .....                      |    | 14,000 |
| 26  | " .....     | " .....                      |    | 18,000 |
| 30  | " .....     | " .....                      |    | 25,000 |
| 36  | " .....     | " .....                      |    | 40,000 |

### Special Objectives

Objectives made for flattening the spectrum at any wave length. Amplifying lenses, double, triple and quadruple lenses corrected for any part of the spectrum. Standard Objectives up to 6 inch aperture usually kept in stock. Prices given on application for wide field Astronomical Camera Lenses.

### Price List of Plane Mirrors for Coelostats, Siderostats, Etc.

These Mirrors are corrected to one-fifth sodium light wave, and are free from zonal errors.

|                   |                        |  |    |       |
|-------------------|------------------------|--|----|-------|
| Plane Mirror..... | 5 inches diameter..... |  | \$ | 35    |
| “ .....           | 6 “ .....              |  |    | 45    |
| “ .....           | 7 “ .....              |  |    | 60    |
| “ .....           | 8 “ .....              |  |    | 90    |
| “ .....           | 9 “ .....              |  |    | 125   |
| “ .....           | 10 “ .....             |  |    | 175   |
| “ .....           | 12 “ .....             |  |    | 300   |
| “ .....           | 15 “ .....             |  |    | 650   |
| “ .....           | 18 “ .....             |  |    | 950   |
| “ .....           | 20 “ .....             |  |    | 1,350 |
| “ .....           | 24 “ .....             |  |    | 2,000 |
| “ .....           | 30 “ .....             |  |    | 3,000 |
| “ .....           | 36 “ .....             |  |    | 4,500 |

Larger sizes made to order.

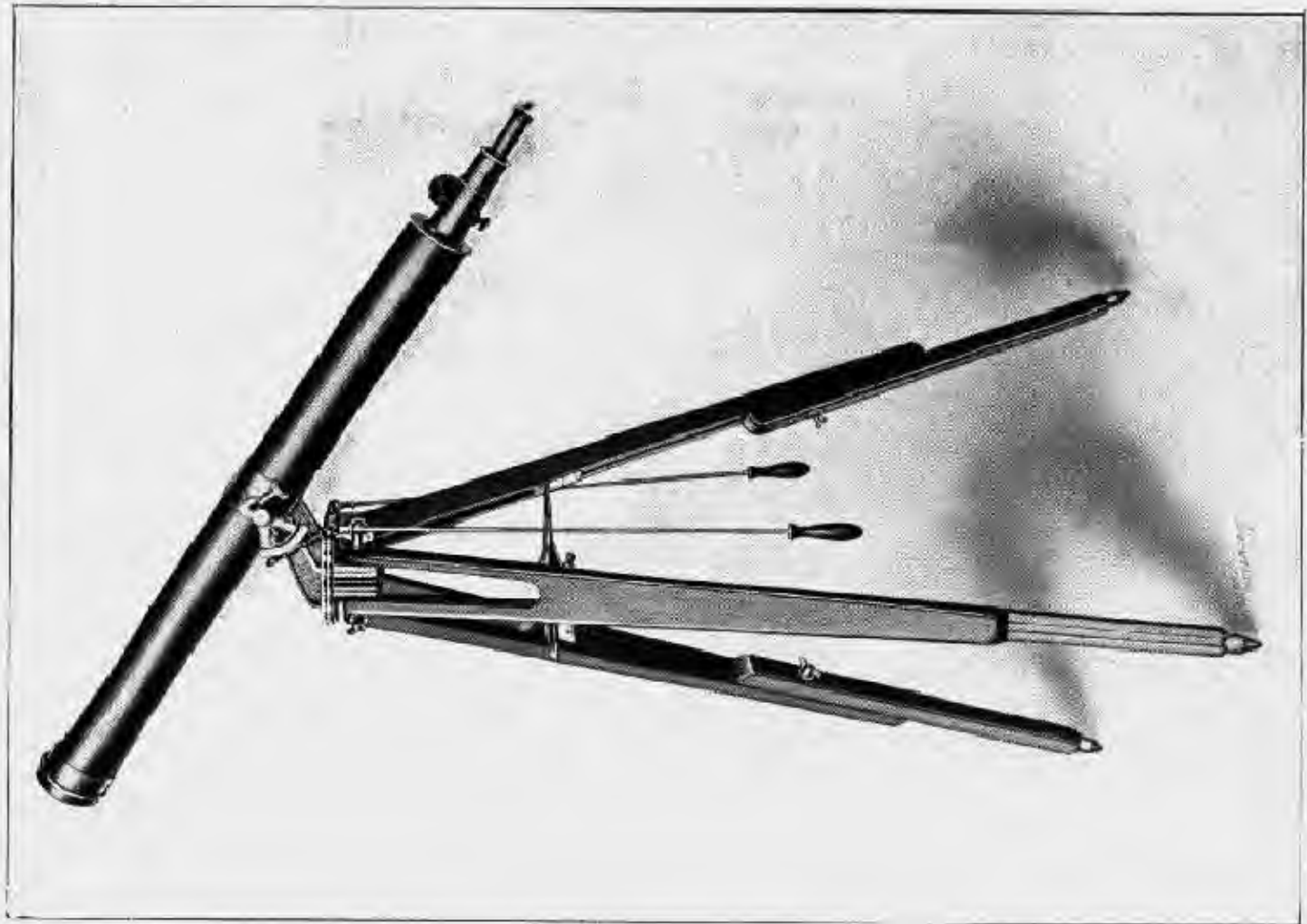
**Price List of Specula and Plane Mirrors for  
Newtonian Silvered Glass Reflecting Telescopes**

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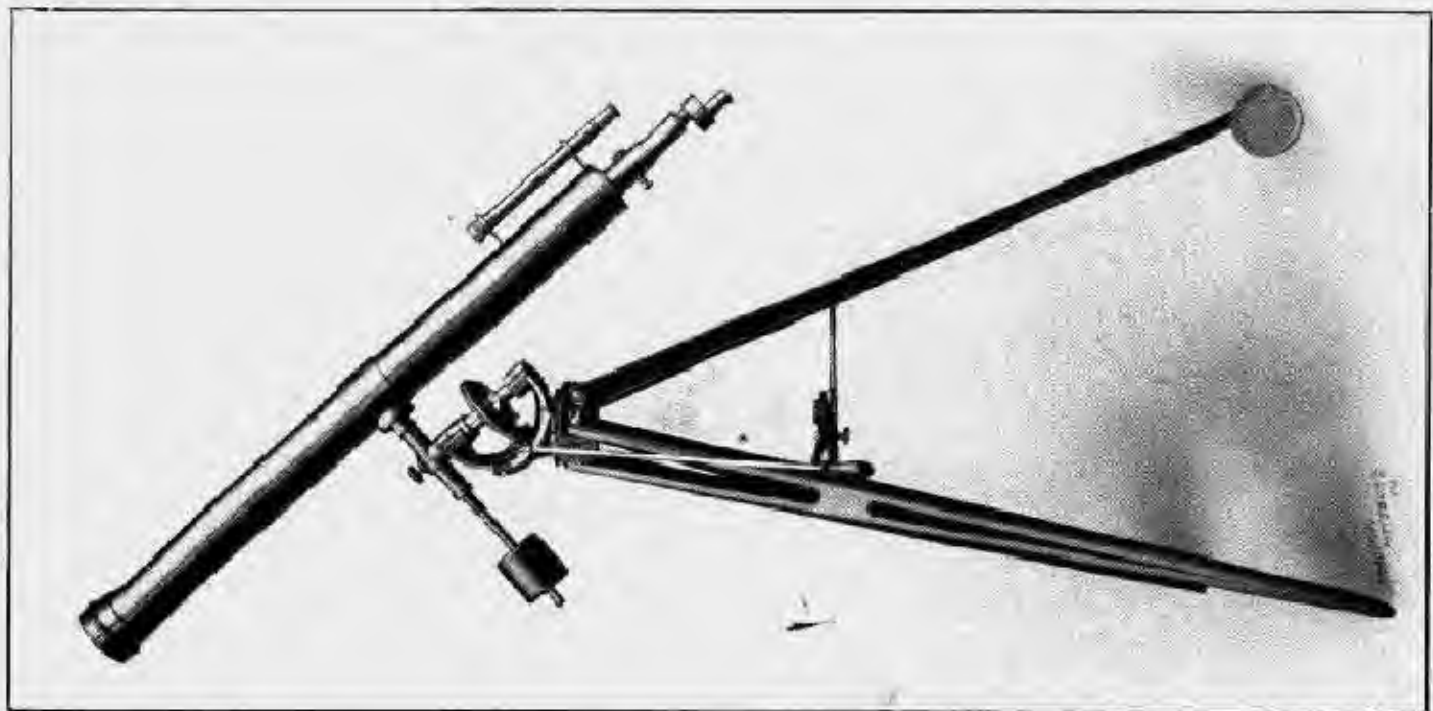
|                    |           |           |        |                    |        |
|--------------------|-----------|-----------|--------|--------------------|--------|
| 5 inches diameter, | 4 feet    | focus, \$ | 30,    | Diagonal Plane, \$ | 8.00   |
| 6 " "              | 5 "       | "         | 40,    | " "                | 8.50   |
| 7 " "              | 6 "       | "         | 55,    | " "                | 9.25   |
| 8 " "              | 6 " 3 in. | "         | 80,    | " "                | 10.00  |
| 9 " "              | 6 " 6 in. | "         | 100,   | " "                | 12.00  |
| 10 " "             | 7 "       | "         | 150,   | " "                | 14.50  |
| 11 " "             | 7 " 6 in. | "         | 200,   | " "                | 18.00  |
| 12 " "             | 8 "       | "         | 250,   | " "                | 25.00  |
| 15 " "             | 10 "      | "         | 375,   | " "                | 40.00  |
| 18 " "             | 11 "      | "         | 650,   | " "                | 65.00  |
| 20 " "             | 12 "      | "         | 1,000, | " "                | 100.00 |
| 24 " "             | 15 "      | "         | 1,600, | " "                | 175.00 |
| 30 " "             | 17 "      | "         | 2,800, | " "                | 300.00 |

We also make Mirrors for the Cassegrain form of reflecting telescope, which are especially adapted to spectroscopic studies.

Prices quoted for larger Mirrors up to 7 feet diameter.



Alt-Azimuth Refracting Telescope,  
Mounted on strong tripod. See pages 8 and 9.



Equatorial Refracting Telescope,  
Mounted on strong tripod. See pages 8 and 9.



## Price List of Small Refracting Telescopes

### Alt-Azimuth Mounting on Strong Tripod

| Without slow motions. | With one slow motion, | With two slow motions. |
|-----------------------|-----------------------|------------------------|
| 2.5-inch \$100.....   | \$120.....            | \$140                  |
| 3 " 125.....          | 145.....              | 165                    |
| 3.5 " 160.....        | 180.....              | 200                    |
| 4 " 225.....          | 250.....              | 275                    |
| 4.5 " 275.....        | 300.....              | 325                    |

Three Celestial Eye-pieces furnished with 2.5-inch and 3.5-inch.

Four " " " " 4 " " 4.5 "

Finder supplied with 4-inch and 4.5-inch.

Finders furnished with 2.5, 3 and 3.5-inch, \$20 extra.

Diagonal, \$15 extra.

Prism Terrestrial Eye-piece, to use any of the Celestial Eye-pieces furnished with telescope, \$35 extra.

Achromatic Pancratic Eye-piece, \$25.

Light portable folding tripods furnished for sizes up to 4-inch aperture if so desired.

### Equatorial Mounting on Strong Tripod

|   |   |   |
|---|---|---|
| 3 -inch Without Circles or Clock, \$185 | } | Circles and driving clock<br>not recommended for tripod<br>mountings. |
| 3.5 " " " " " 225                       |   |   |
| 4 " " " " " 300                         |   |   |
| 4.5 " " " " " 325                       |   |   |

Finder not included in cost of 3 and 3.5-inch.

4-inch and 4.5-inch have finders.

Tripod Equatorials have slow motion in right ascension by tangent screw.

Three Celestial Eye-pieces furnished with 3 and 3.5-inch.

Four " " " " 4 " 4.5 "

Diagonals, \$15 extra.

Terrestrial Eye-pieces (4-lens type), \$10 extra.

Prism Terrestrial Eye-piece, to use any of the Celestial eye-pieces furnished with telescope, \$35 extra.

**Price List of Telescopes Mounted on Tripod  
or Iron Column, from 5 to 6 inches aperture**

---

**Equatorials without circles and  
driving clock**

| Mounted on tripod.  | Mounted on plain iron column. |
|---------------------|-------------------------------|
| 5 -inch, \$500..... | \$600                         |
| 5.5 " 575.....      | 675                           |
| 6 " 700.....        | 825                           |

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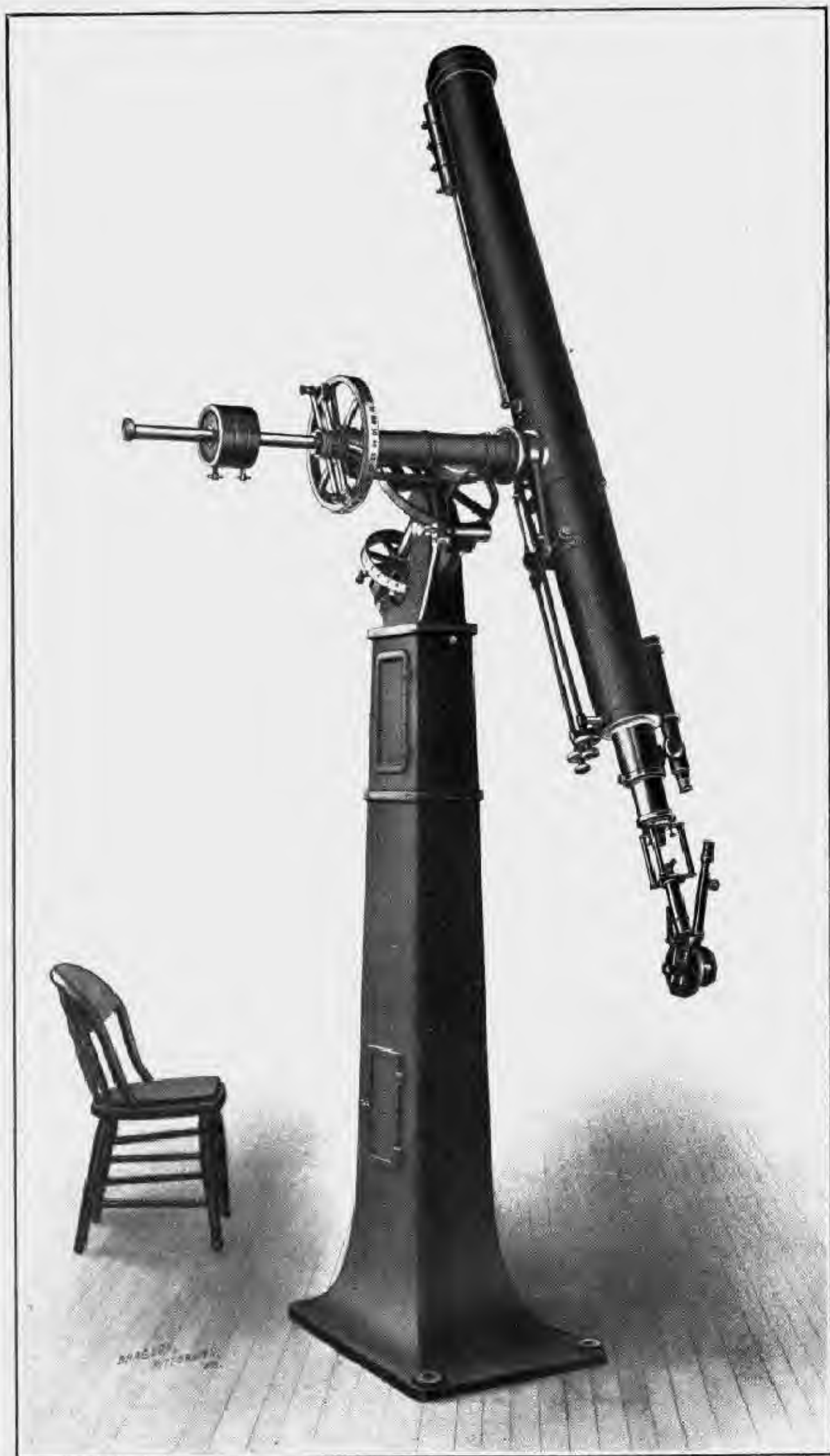
**Alt-Azimuth mounting on tripod**

| Without slow motion. | With one slow motion. | With two slow motions. |
|----------------------|-----------------------|------------------------|
| 5 -inch, \$425.....  | \$450.....            | \$475                  |
| 5.5 " 500.....       | 525.....              | 550                    |
| 6 " 600.....         | 635.....              | 670                    |

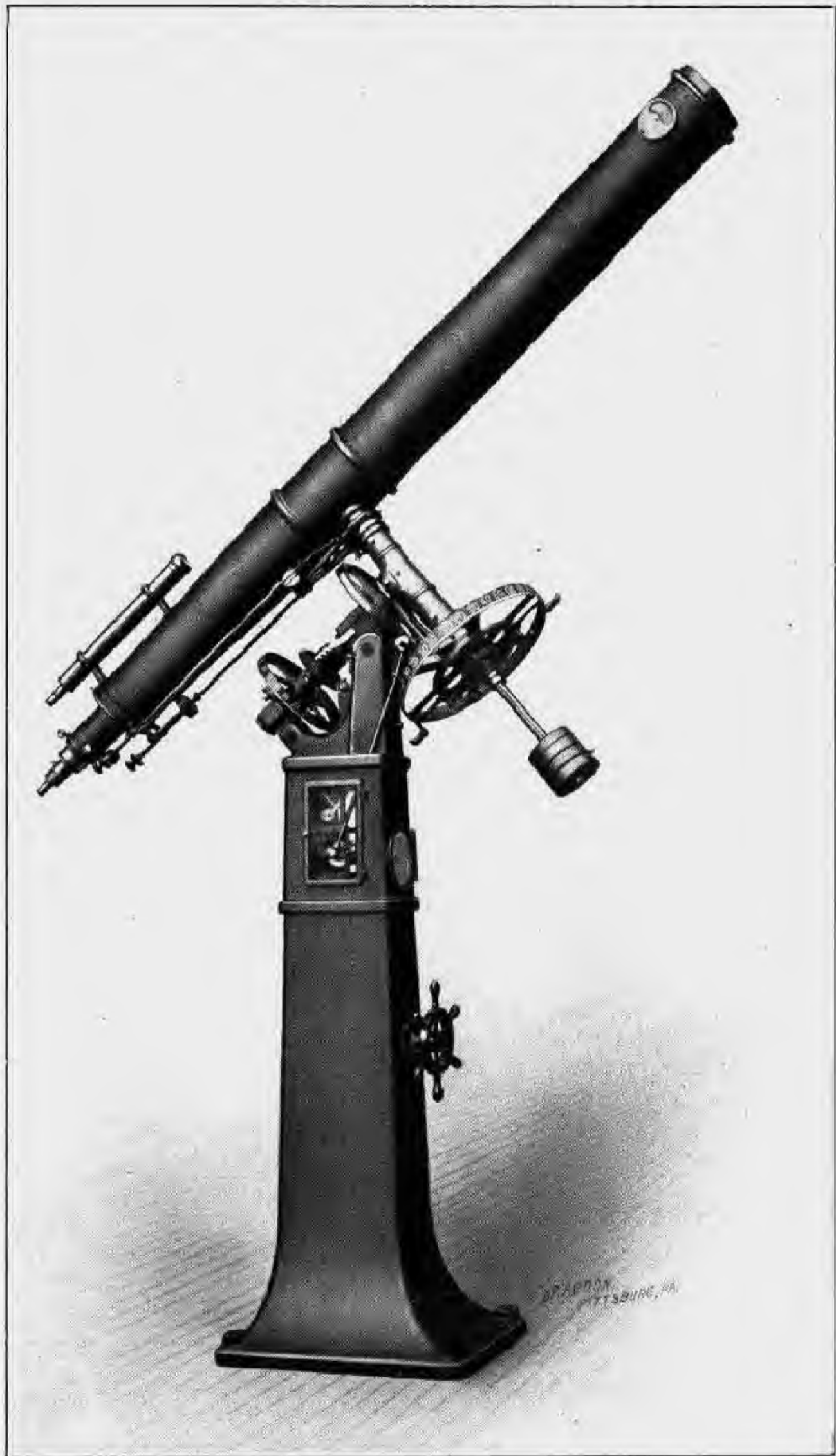
Telescopes mounted on tripod too heavy to handle if over 6 inches diameter of objective.

Circles and driving clock not recommended for telescopes mounted on tripod.

Above instruments furnished with finder, four eyepieces, diagonal prism and dark sun cap. Herschel prism and polarizing helioscopes for solar observations, extra.



Standard 6-Inch Equatorial Telescope,  
Showing small spectroscope attached. See page 12.



Standard 10 and 12-inch Equatorial Telescope.  
See page 14.



## Price List of Equatorial Telescopes

### Mounted on Iron Columns

#### 4-Inch Equatorial Telescope

|   |        |
|---|--------|
| 4-inch equatorial mounting on iron column, complete with R. A.<br>and declination clamps and slow motions ..... | \$ 275 |
| 4-inch objective in cell.....   | 100    |
| Five eye-pieces, one for finder, at \$5 each.....   | 25     |
| 1.5-inch finder objective in cell.....  | 10     |
| Diagonal prism.....   | 15     |
|   | \$ 425 |

#### EXTRAS

|  |       |
|--|-------|
| Right ascension and declination circles..... | \$ 75 |
| Driving clock.....                           | 150   |

#### 6-Inch Equatorial Telescope

|  |         |
|--|---------|
| 6-inch equatorial mounting, including driving clock, coarse and fine<br>circles, R. A. and declination clamps and slow motions at eye<br>end ..... | \$1,200 |
| 6-inch objective in cell.....  | 325     |
| 2-inch finder objective in cell.....   | 20      |
| Five eye-pieces, one for finder, at \$5 each.....  | 25      |
| Diagonal prism.....  | 20      |
|  | \$1,590 |

#### EXTRAS

|  |       |
|--|-------|
| Filar micrometer.....                              | \$200 |
| Four positive eye-pieces for same at \$5 each..... | 20    |
| Helioscope .....                                   | 50    |
| Herschel prism.....                                | 35    |

## Price List of Equatorial Telescopes

### Mounted on Iron Columns

(Continued)

#### 8-Inch Equatorial Telescope

|   |         |
|---|---------|
| 8-inch equatorial mounting, including driving clock, coarse and fine circles, R. A. and declination clamps and slow motion at eye end ..... | \$2,300 |
| 8-inch objective in cell.....   | 700     |
| 2.5-inch finder objective in cell.....  | 30      |
| Six eye-pieces, one for finder, at \$5 each.....  | 30      |
| Diagonal prism.....   | 20      |
| Wide field eye-piece.....   | 20      |
| Sidereal dial, R. A. circle and R. A. quick motion on north side of pier.....   | 300     |
|   | \$3,400 |

#### EXTRAS

(For 8-inch equatorial)

|  |       |
|--|-------|
| Filar micrometer.....                              | \$350 |
| Four positive eye-pieces for same at \$5 each..... | 20    |
| Helioscope .....                                   | 50    |
| Herschel prism .....                               | 35    |

#### 9-Inch Equatorial Telescope

|  |         |
|--|---------|
| 9-inch equatorial mounting, driving clock, coarse and fine circles, R. A. and declination clamps and slow motion at eye end... | \$2,500 |
| Object glass.....  | 900     |
| 2.5-inch finder objective in cell.....   | 30      |
| Six negative eye-pieces, one for finder, at \$5 each.....  | 30      |
| Diagonal prism.....  | 20      |
| Low power eye-piece .....  | 20      |
| Sidereal dial, R. A. circle and R. A. quick motion at north side of column.....  | 300     |
|  | \$3,800 |

Extras same price as for the 8-inch equatorial.

## Price List of Equatorial Telescopes

### Mounted on Iron Columns

(Continued)

#### 10-Inch Equatorial Telescope

|   |         |
|---|---------|
| 10-inch equatorial mounting, including driving clock, coarse and fine circles, R. A. and declination clamps and slow motion at eye end..... | \$3,000 |
| 10-inch objective in cell.....  | 1,125   |
| 3-inch finder objective in cell.....  | 50      |
| Six eye-pieces, one for finder, at \$5 each.....  | 30      |
| One diagonal prism.....   | 20      |
| One wide field eyepiece.....  | 20      |
| Sidereal dial, R. A. circle and R. A. quick motion on north side of column.....   | 400     |
|   | \$4,645 |

#### EXTRAS

|  |       |
|--|-------|
| Filar micrometer.....                              | \$450 |
| Four positive eye-pieces for same at \$5 each..... | 20    |
| Polarizing helioscope.....                         | 50    |
| Herschel prism.....                                | 35    |

#### 12-Inch Equatorial Telescope

|   |         |
|---|---------|
| 12-inch equatorial mounting, including same parts as the 10-inch,               | \$3,400 |
| 12-inch objective in cell.....  | 2,000   |
| 3-inch finder objective in cell.....  | 50      |
| Six eye-pieces, one for finder, at \$5 each.....                                | 30      |
| One diagonal prism.....   | 20      |
| One wide field eye-piece.....   | 20      |
| Sidereal dial, R. A. circle and R. A. quick motion on north side of column..... | 400     |
|   | \$5,920 |

#### EXTRAS

|  |       |
|--|-------|
| Filar micrometer.....                              | \$450 |
| Five positive eye-pieces for same at \$5 each..... | 25    |
| Polarizing helioscope.....                         | 50    |
| Herschel prism.....                                | 35    |



## Price List of Equatorial Telescopes

### Mounted on Iron Columns

(Continued)

#### 15-Inch Equatorial Telescope

|   |          |
|---|----------|
| 15-inch equatorial mounting, including driving clock, coarse and fine circles, R. A. and declination clamps and slow motion at eye end..... | \$6,000  |
| 15-inch objective in cell .....   | 3,800    |
| 4-inch finder objective in cell. ....   | 100      |
| Six negative eye-pieces, one for finder, at \$5 each .....  | 30       |
| Diagonal prism.....   | 20       |
| Low power wide field eye-piece.....   | 25       |
| Sidereal dial, R. A. circle and R. A. quick motion on north side of column.....   | 600      |
|   | \$10,575 |

#### EXTRAS

|  |       |
|--|-------|
| Filar micrometer.....                              | \$600 |
| Six positive eye-pieces for same at \$5 each. .... | 30    |
| Polarizing helioscope. ....                        | 50    |
| Herschel prism.....                                | 35    |

#### 18-Inch Equatorial Telescope

|   |          |
|---|----------|
| 18-inch equatorial mounting, including driving clock, coarse and fine circles, R. A. and declination clamps and slow motion at eye end..... | \$7,100  |
| 18-inch objective in cell.....  | 6,900    |
| 4-inch finder objective in cell.....  | 100      |
| Six negative eye-pieces at \$5 each.....  | 30       |
| Diagonal prism.....   | 20       |
| Low power wide field eye-piece.....   | 25       |
| Sidereal dial, R. A. circle and R. A. quick motion at north side of column.....   | 1,000    |
|   | \$15,175 |



## Price List of Equatorial Telescopes

Mounted on Iron Columns

(Continued)

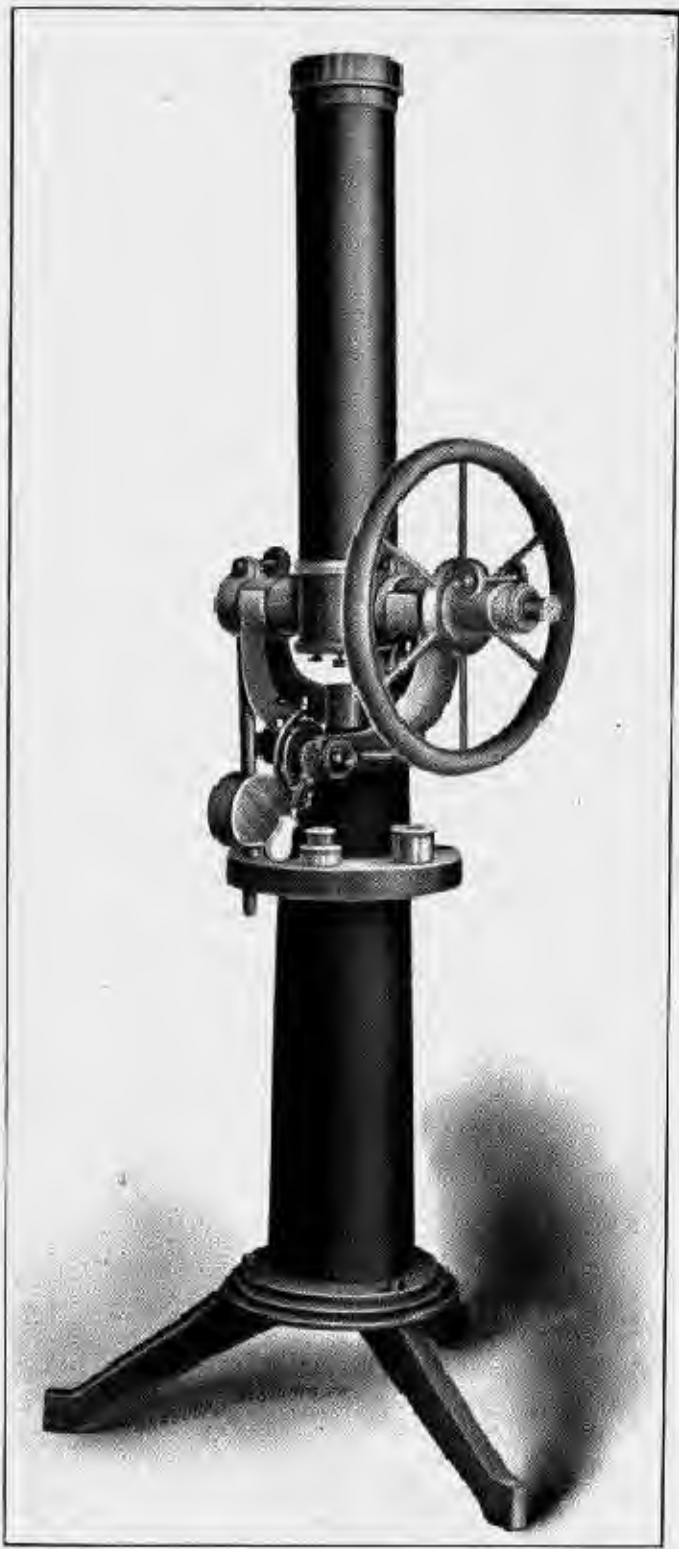
### EXTRAS

For 18-inch telescope

|  |       |
|--|-------|
| Filar micrometer.....                    | \$600 |
| Six positive eye-pieces at \$5 each..... | 30    |
| Polarizing Helioscope.....               | 50    |
| Herschel prism.....                      | 35    |

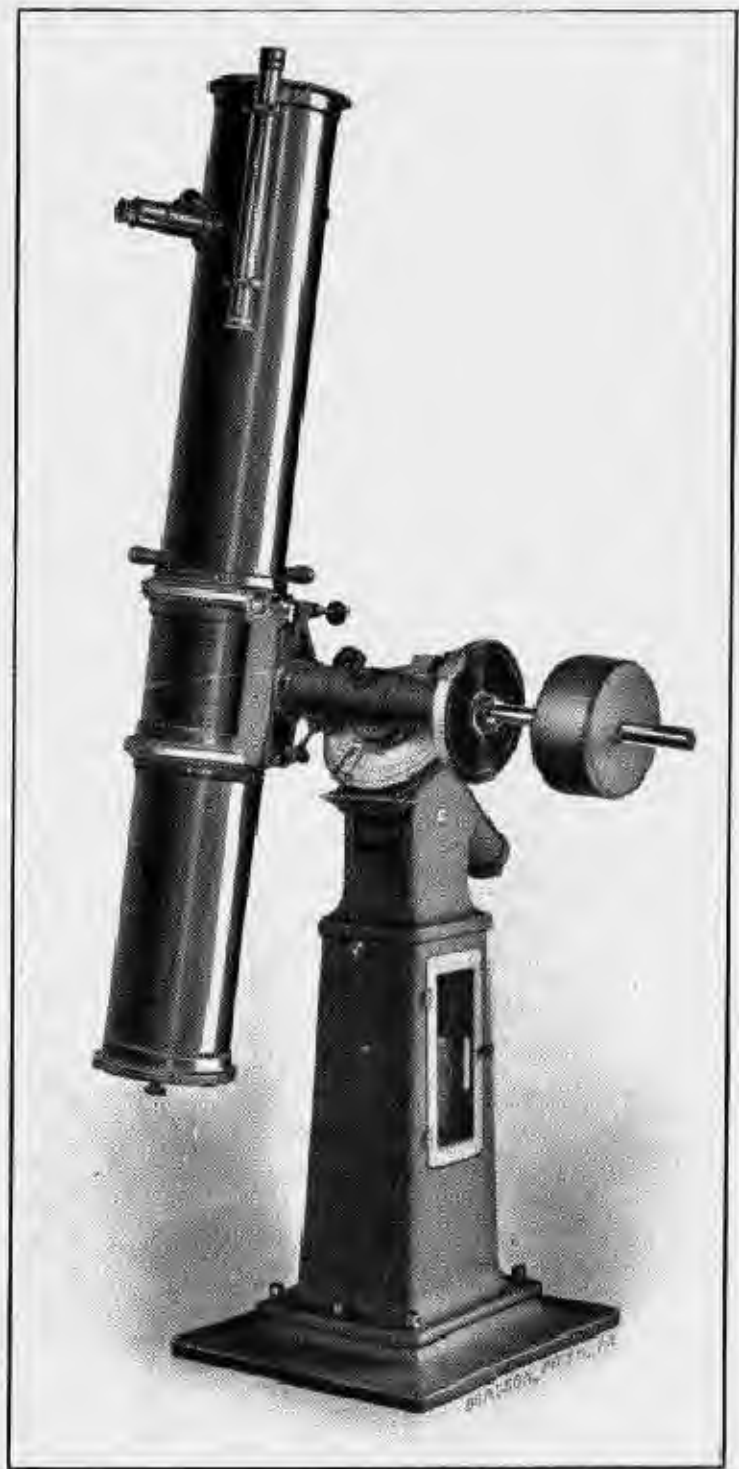
We are prepared to construct telescopes up to 40 inches aperture with every modern appliance for operating the same.

Engravings of our 24 and 30-inch telescopes are shown on pages 35 and 36. Full information regarding these larger instruments given by correspondence or personal conference.



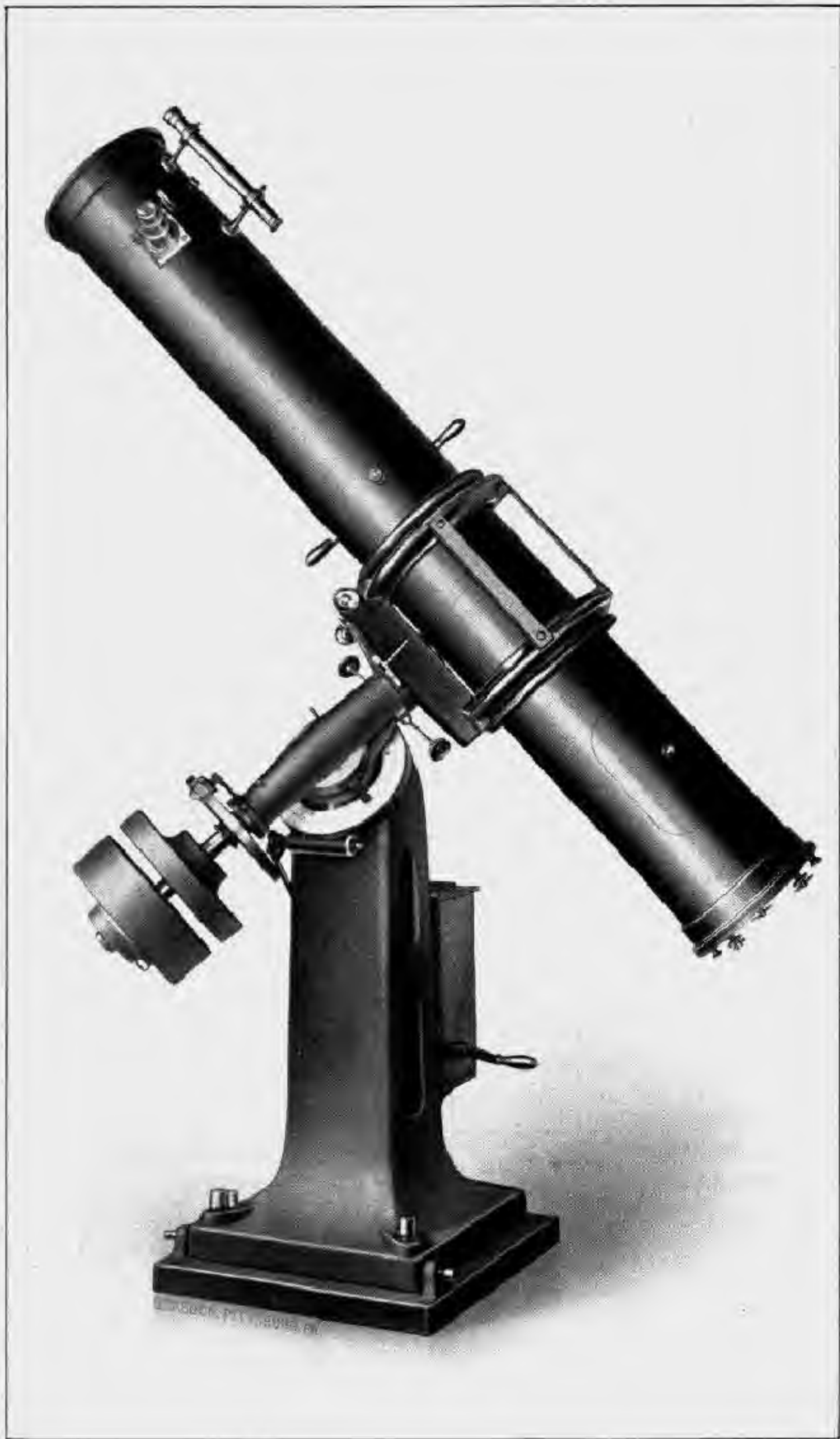
Comet Seeker,

with right angle prism to direct the rays through the axis, at one extremity of which is placed the eye-piece. The field swept over can be regulated by lever and ratchet shown in cut. Sizes from 4 to 6-in. aperture.



Six-Inch Standard Equatorial Reflecting Telescope,

with driving clock and circles, rotating tube and slow motions. See page 20.



Standard Equatorial Reflecting Telescope,  
with circles and driving clock. See page 20.



30-Inch Reflecting Telescope.

May be used either as a Cassegrain or Newtonian, and arranged for attaching Spectroscope or Spectroheliograph See page 20.



**Silvered Glass Reflecting Telescopes**  
**Without circles and driving clock . .**

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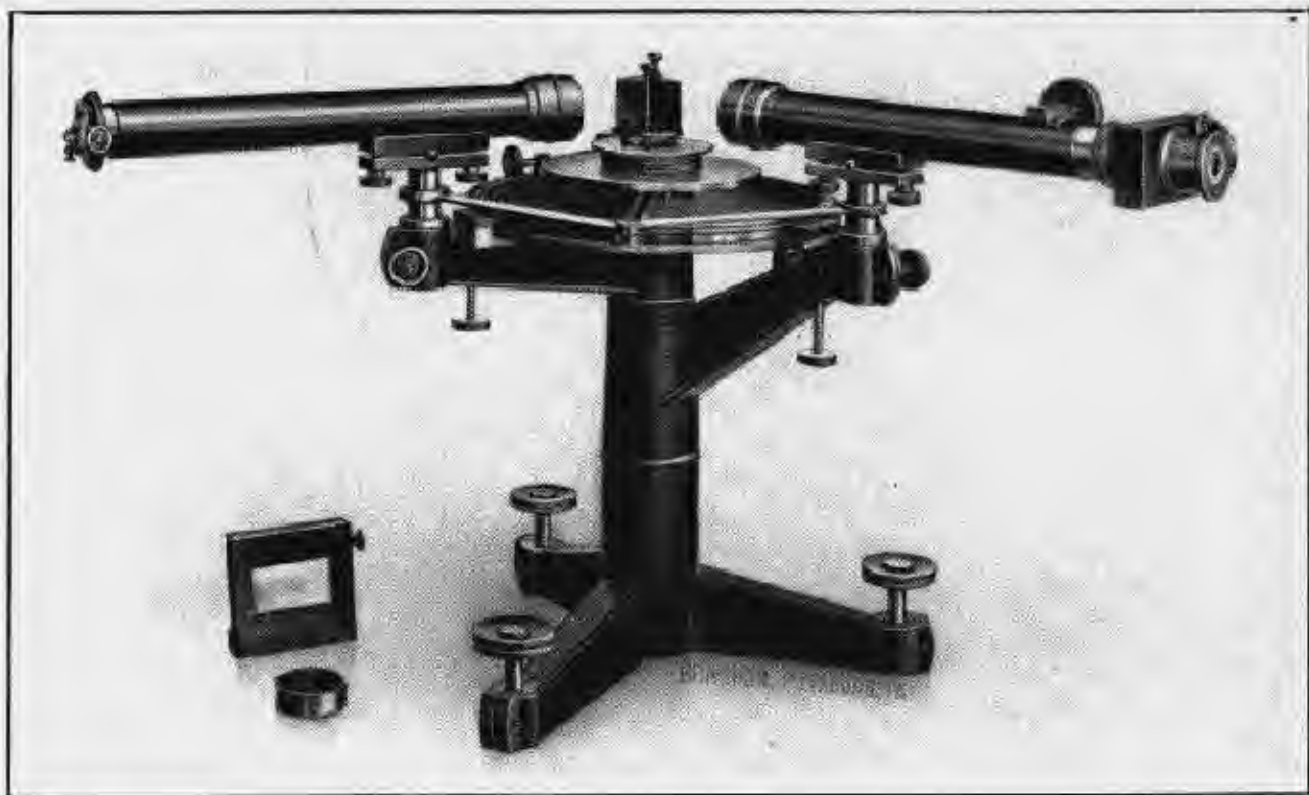
|                     |                           |        |
|---------------------|---------------------------|--------|
| 5 inches aperature, | 4 feet or more focus..... | \$ 225 |
| 6 " " "             | 5 " " " .....             | 300    |
| 7 " " "             | 5 " " " .....             | 375    |
| 8 " " "             | 6 " " " .....             | 500    |
| 9 " " "             | 6 " " " .....             | 625    |
| 10 " " "            | 7 " " " .....             | 775    |
| 11 " " "            | 7 " " " .....             | 925    |
| 12 " " "            | 8 " " " .....             | 1,100  |
| 15 " " "            | 10 " " " .....            | 1,750  |

**Silvered Glass Reflecting Telescopes**  
**With circles and driving clock . . .**

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|                         |        |
|-------------------------|--------|
| 5 inches aperature..... | \$ 575 |
| 6 " " .....             | 650    |
| 7 " " .....             | 775    |
| 8 " " .....             | 900    |
| 9 " " .....             | 1,075  |
| 10 " " .....            | 1,300  |
| 11 " " .....            | 1,650  |
| 12 " " .....            | 1,850  |
| 15 " " .....            | 2,550  |
| 18 " " .....            | 3,000  |
| 20 " " .....            | 4,000  |
| 24 " " .....            | 5,500  |
| 30 " " .....            | 7,500  |

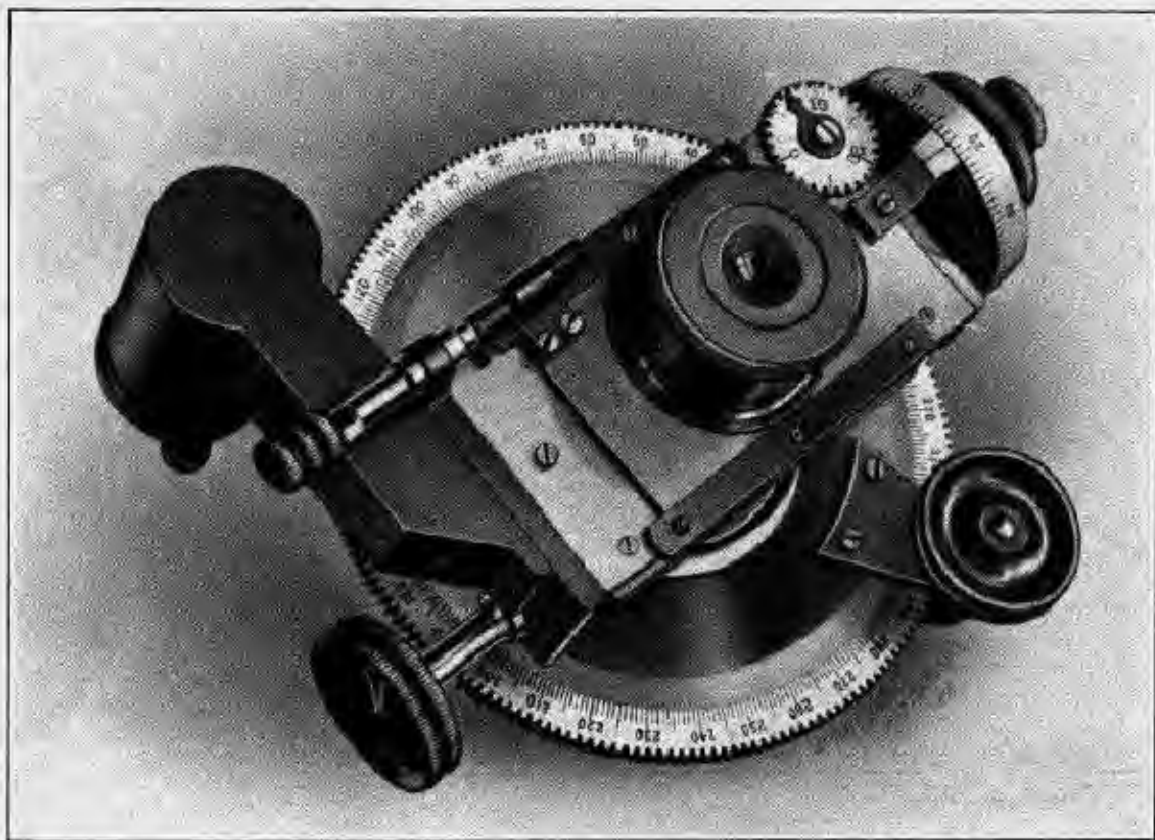
Prices given on application for larger sizes. We can furnish plane, spherical or parabolic mirrors up to 84 inches diameter.



**Standard Laboratory Spectroscope.**

This is a very heavy instrument, with circle, light and dense prisms, grating and all accessories.

Price from \$150 to \$500.

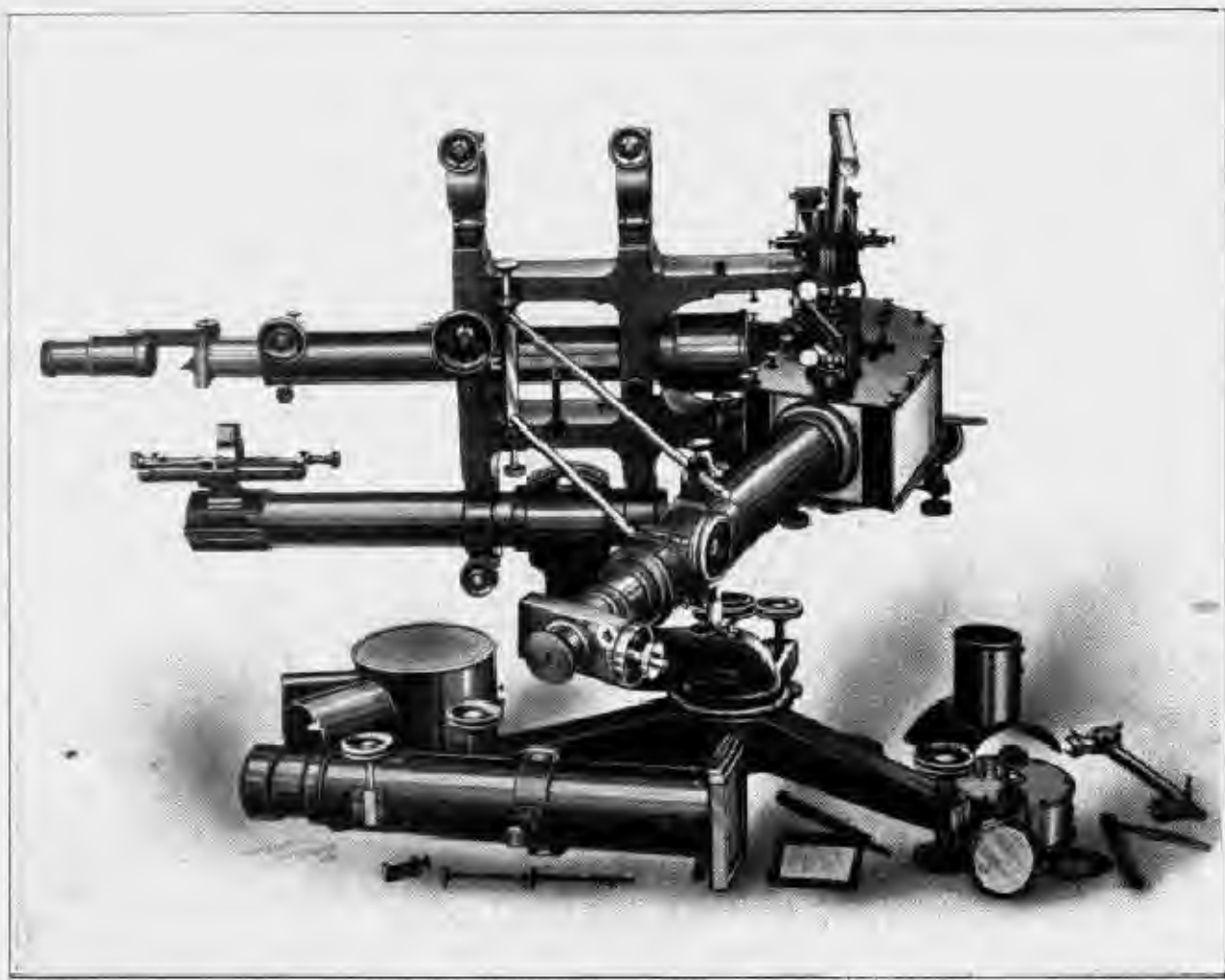


**Parallel Wire Position Micrometer.**

Electric illumination. Price from \$175 to \$500. The illustration shows one of our \$175 instruments.

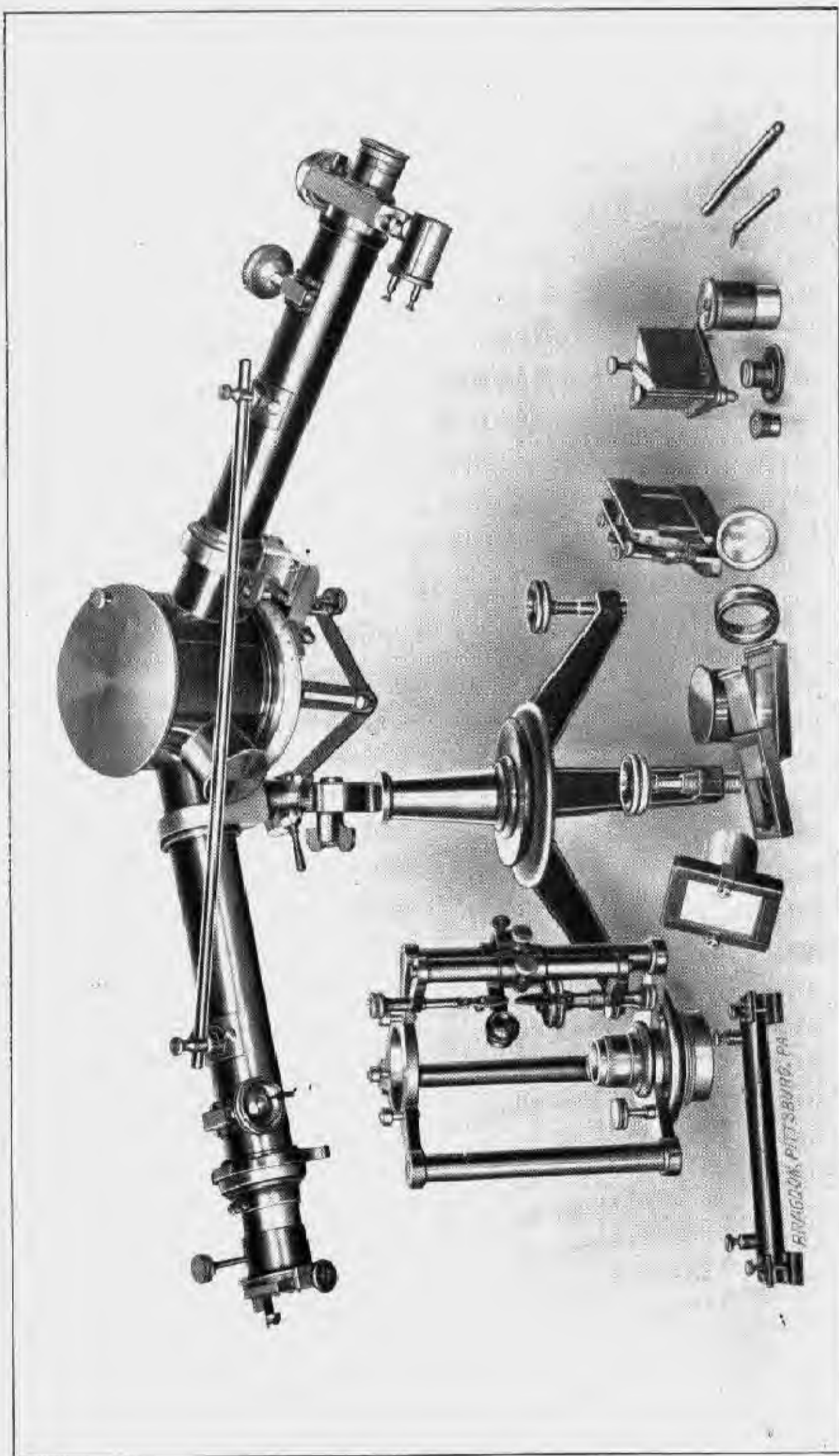


Medium Standard Spectroscope. See page 30.



Standard Spectroscope and Spectrograph.  
Made for the Flower, Emerson McMillan, Philadelphia, Ottawa and other Observatories.  
See page 30.





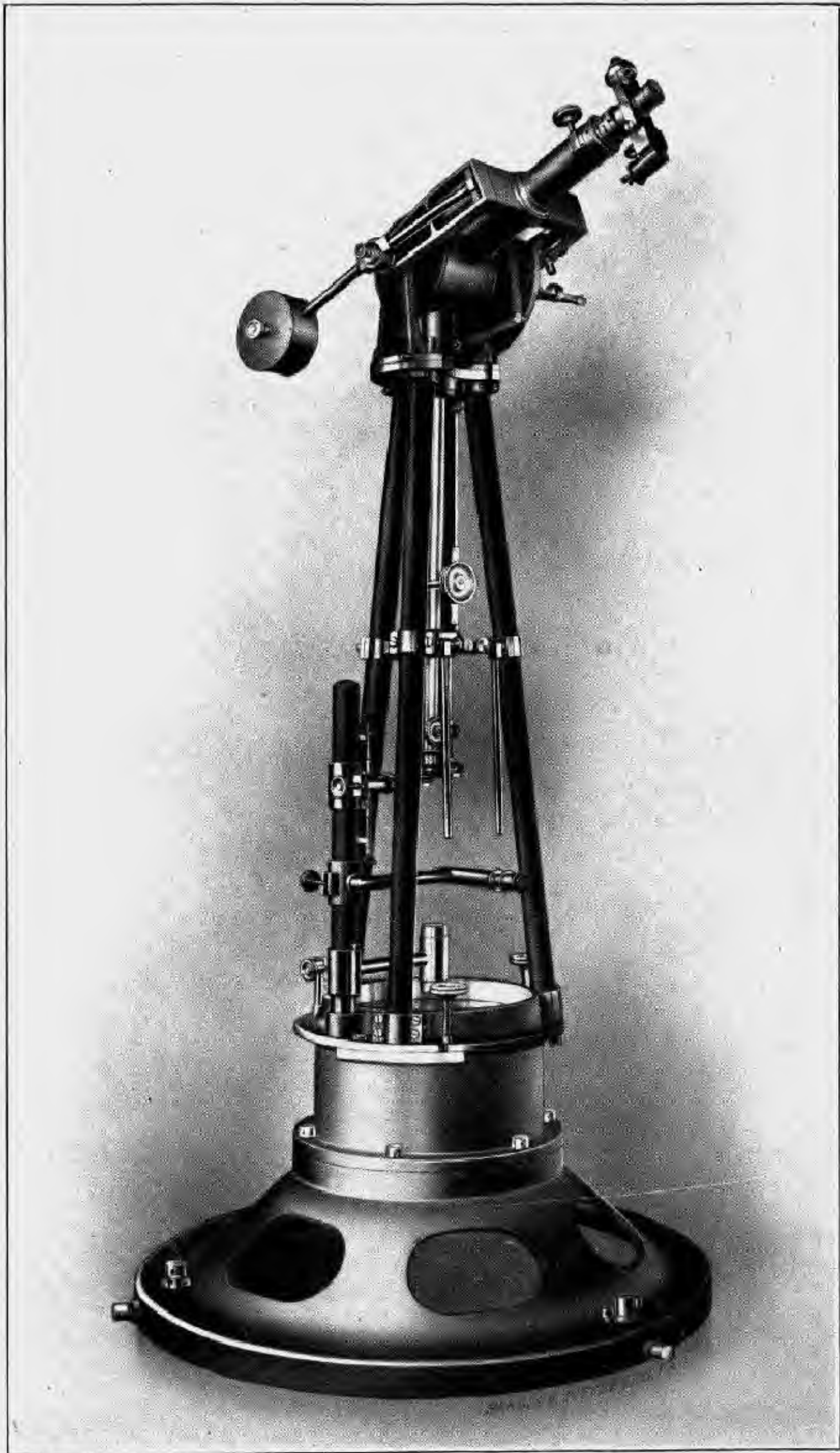
Medium Standard Spectroscope,

with all accessories for astronomical spectroscopy, visual and photographic. Comparison apparatus for metals and gases. See page 30.

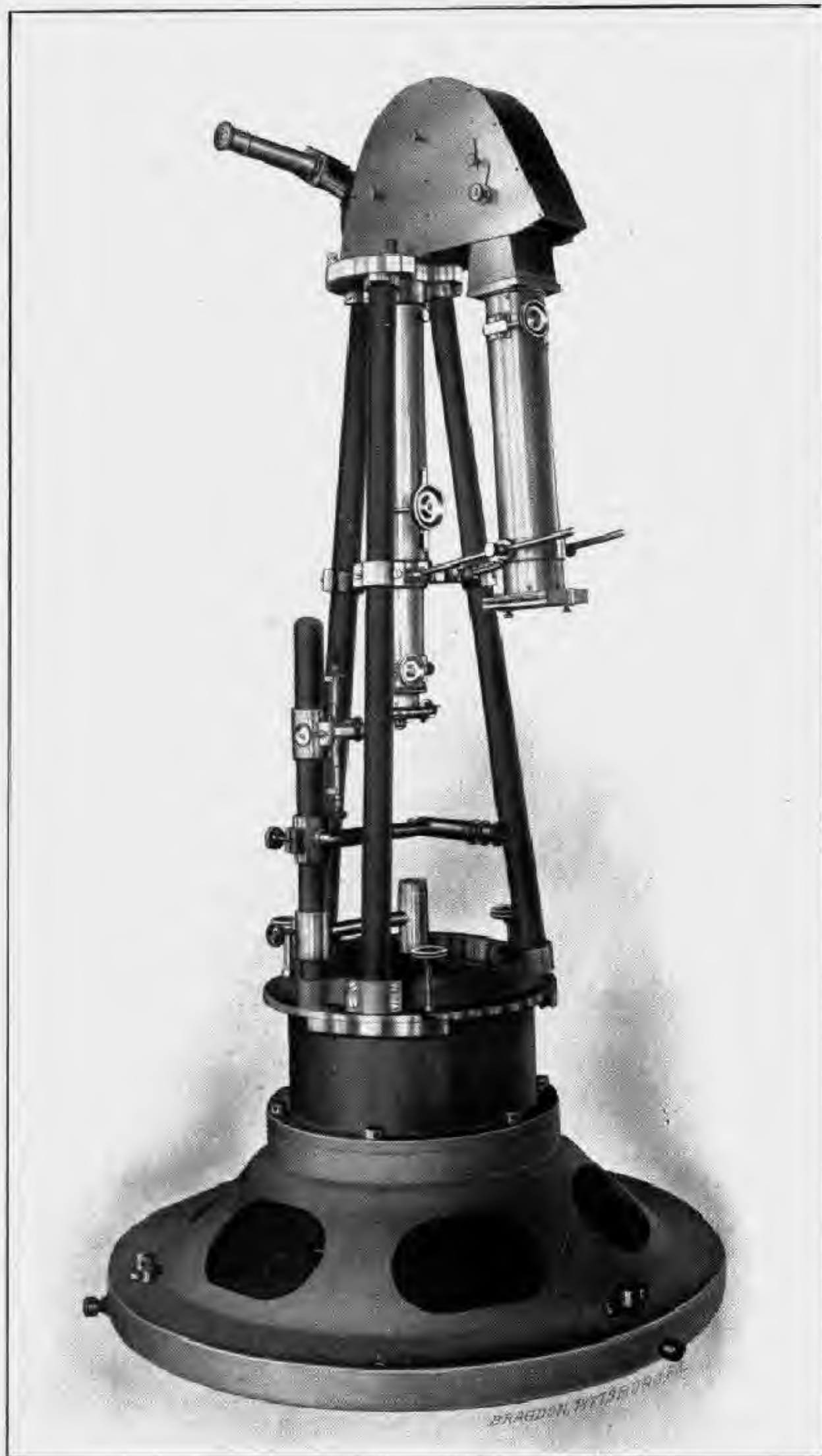




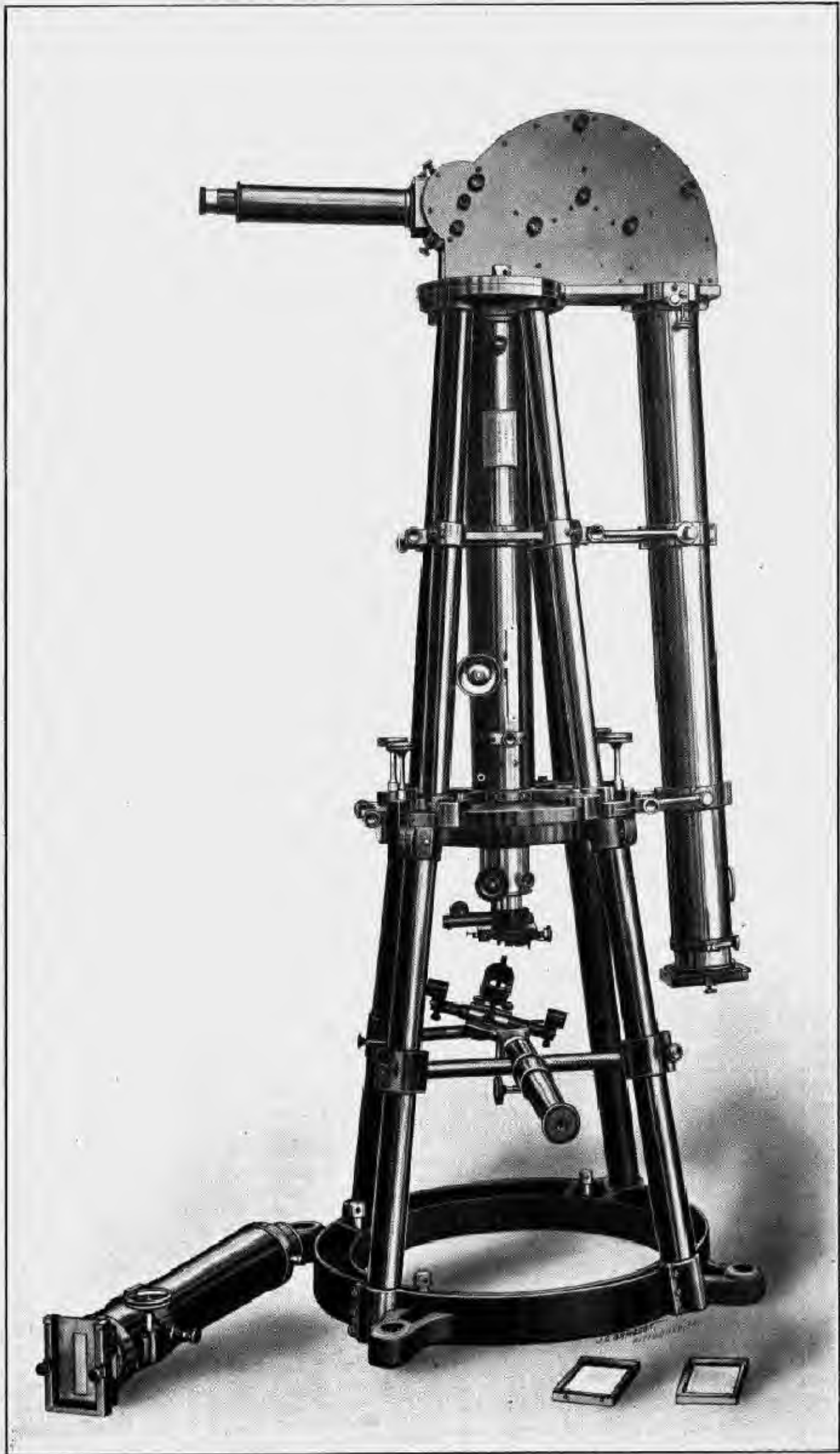
Spectroscope and Spectrograph.  
Made for Allegheny, Yerkes and United States Naval Observatories.  
Engraving shows adaptation for one prism.  
See page 30.



Highest Grade Spectroscope and Spectrograph.  
Engraving shows arrangement for visual work. Made for Lowell Observatory.  
See page 30.

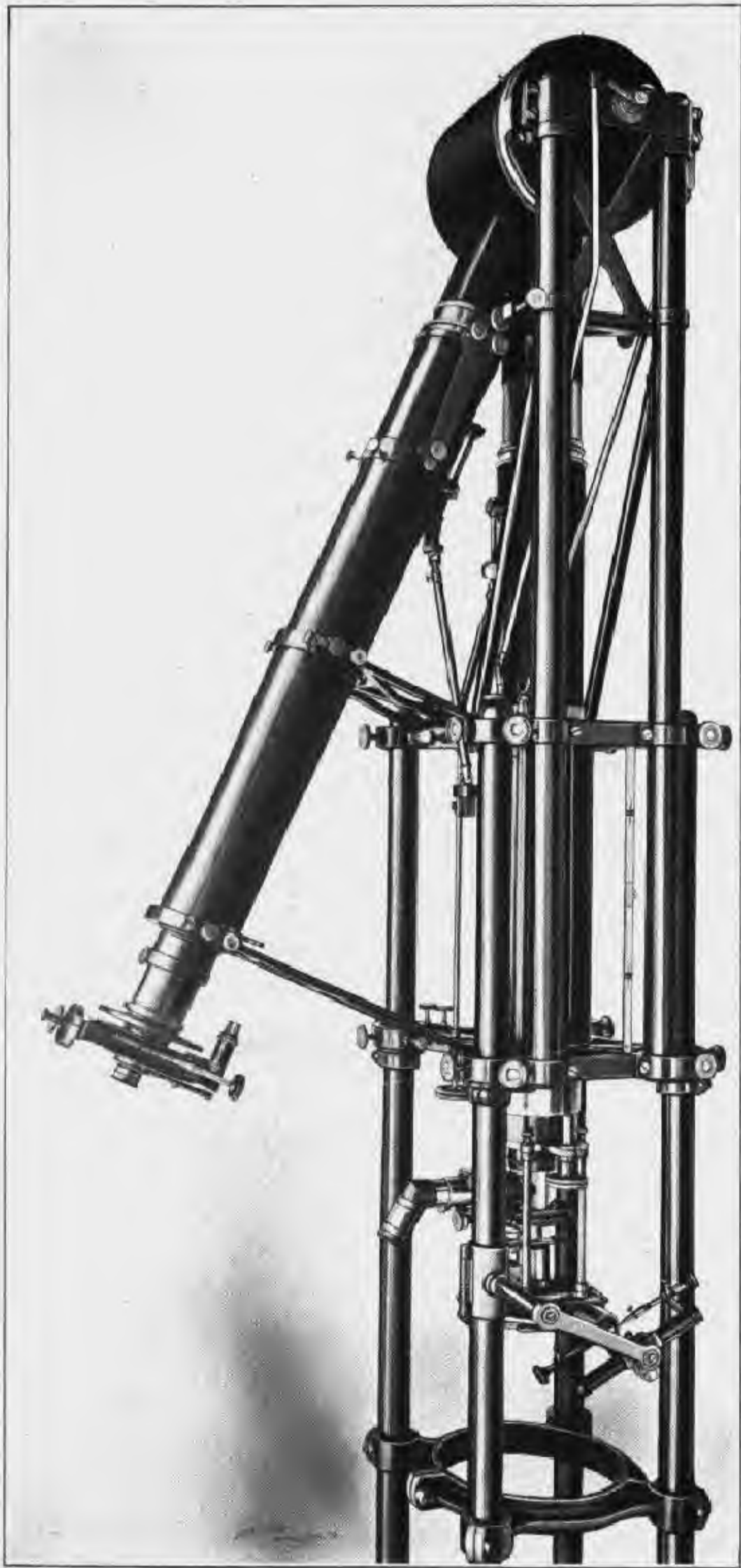


Highest Grade Spectroscope and Spectrograph.  
Engraving shows arrangement for photography. Made for Lowell Observatory.  
See page 30.

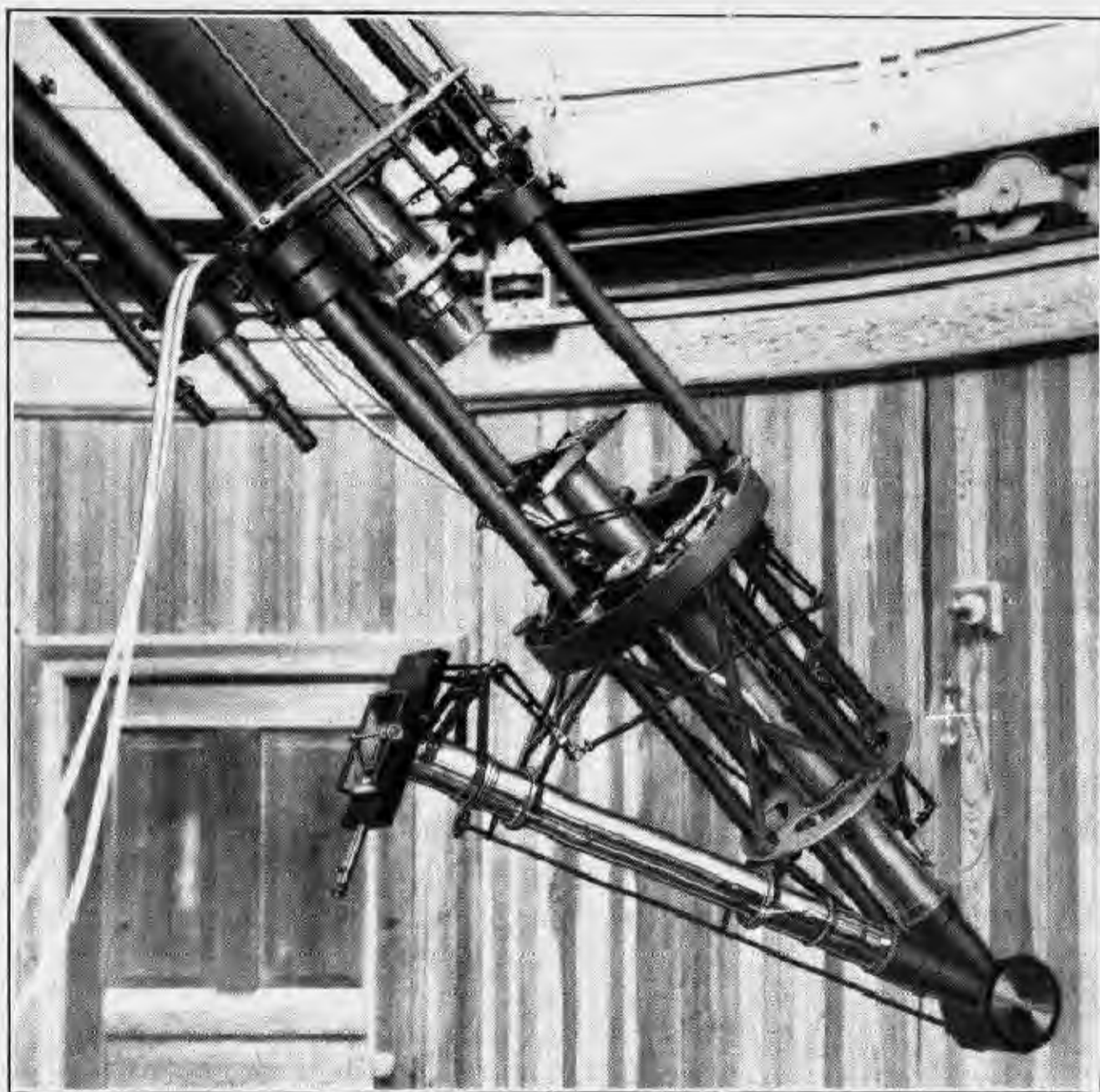


The Mills Spectrograph.  
Made for Lick Observatory. See page 30.





The Princeton Spectroscope.  
Made for Prof. C. A. Young, Director Halstead Observatory.  
See page 30.



The Kenwood Observatory Spectroheliograph.  
Made for Prof. Geo. E. Hale. Other forms of this instrument made to order.  
Prices given on application.

**Spectroscopes—With plane grating  
and prisms for astrophysical studies**

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|  |                  |
|--|------------------|
| Smallest size for telescopes, 3 to 6-inch aperture, visual only, with one prism and small grating.....                                   | \$ 100           |
| Medium size for telescopes, 4 to 8-inch aperture, visual only, two single prisms and small grating.....                                  | 210              |
| Medium standard for telescopes, 6 to 12-inch aperture, visual only, two single prisms and small grating.....                             | 415              |
| Medium standard for telescopes, 6 to 12-inch aperture suitable for both visual and photographic work, two single prisms and grating..... | 650              |
| Larger standard for telescopes, 10 inches aperture up to any size, with two single prisms and grating.....                               | 1,000            |
| Larger standard for telescopes, 10 inches aperture up to any size, with battery of two prisms and grating.....                           | 1,375            |
| Larger standard for telescopes, 10 inches aperture up to any size, with battery of three prisms and grating.....                         | 1,500            |
| Large star spectroscope, for telescopes 12 inches aperture up to any size, complete in all accessories.....                              | \$3,000 to 3,500 |

Single Prism Spectrographs for line of sight work, made to order.

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**Spectroheliographs**

Prices on various types of spectroheliographs furnished on request.



## Price List of Gratings

| Diameter of Surface | Character of Surface | Ruled Surface     | Radius of Curvature | D     | C     | B     | A     |
|---------------------|----------------------|-------------------|---------------------|-------|-------|-------|-------|
| 1.4-inch            | Flat.....            | { 0.75x1.2 -in. } | .....               | \$ 15 | \$ 20 | \$ 25 | \$ 30 |
|                     |                      | { 0.9 x1.03-in. } |                     |       |       |       |       |
|                     | Concave...           | { 0.5 x1.25-in. } | 4-ft.               | 20    | 25    | 35    | 40    |
|                     |                      | { 0.75x1.12-in. } | 3-ft.               | 25    | 30    | 35    | 40    |
| 2.5-inch            | Flat.....            | { 1.25x1.9 -in. } | .....               | 30    | 40    | 50    | 60    |
|                     |                      | { 1.5 x1.75-in. } |                     |       |       |       |       |
|                     | Concave....          | { 1. x2.1 -in. }  | 6-ft.               | 40    | 50    | 60    | 70    |
|                     |                      | { 1.4 x1.9 -in. } | 4-ft.               | 50    | 65    | 75    | 85    |
| 4 - inch            | Flat.....            | { 1.75x3.2 -in. } | .....               | 75    | 85    | 100   | 115   |
|                     |                      | { 2.25x3. -in. }  |                     |       |       |       |       |
|                     | Concave....          | { 1.5 x3.5 -in. } | 10-ft.              | 90    | 110   | 130   | 150   |
|                     |                      | { (2 x3.4)-in. }  | 7-ft.               | 100   | 125   | 150   | 175   |
| 5 - inch            | Flat.....            | { 2.5 x3.9 -in. } | .....               | 125   | 150   | 175   | 200   |
|                     |                      | { 2.9 x3.6 -in. } |                     |       |       |       |       |
|                     | Concave....          | { 1.75x4.3 -in. } | 15-ft.              | 150   | 175   | 200   | 225   |
|                     |                      | { (2.5x3.9)-in. } | 10-ft.              | 175   | 200   | 225   | 250   |
| 6 - inch            | Flat.....            | { 3 x5.4 -in. }   | .....               | 200   | 250   | 275   | 300   |
|                     |                      | { 3.5 x5.1 -in. } |                     |       |       |       |       |
|                     | Concave....          | { 2 x5.8 -in. }   | 21-ft.              | 250   | 300   | 325   | 350   |
|                     |                      | { (3 x5.4)-in. }  | 15-ft.              | 300   | 350   | 375   | 400   |

### Explanation of Symbols

Gratings marked "B", "C" and "D" are all of the same general quality, as free from "Ghosts" as possible, but of varying degrees of excellence from the standpoint of brightness and definition.

Gratings marked "A" are distinguished as being particularly good in definition and in all other respects.

The width of the ruled space (length of ruled lines) is optional, except where a separate price is given in the case of a flat grating, and where the dimensions are given in parenthesis in the case of the concave grating. In this latter case a somewhat higher price may be charged on account of the greater difficulty of ruling perfectly a grating with long lines.

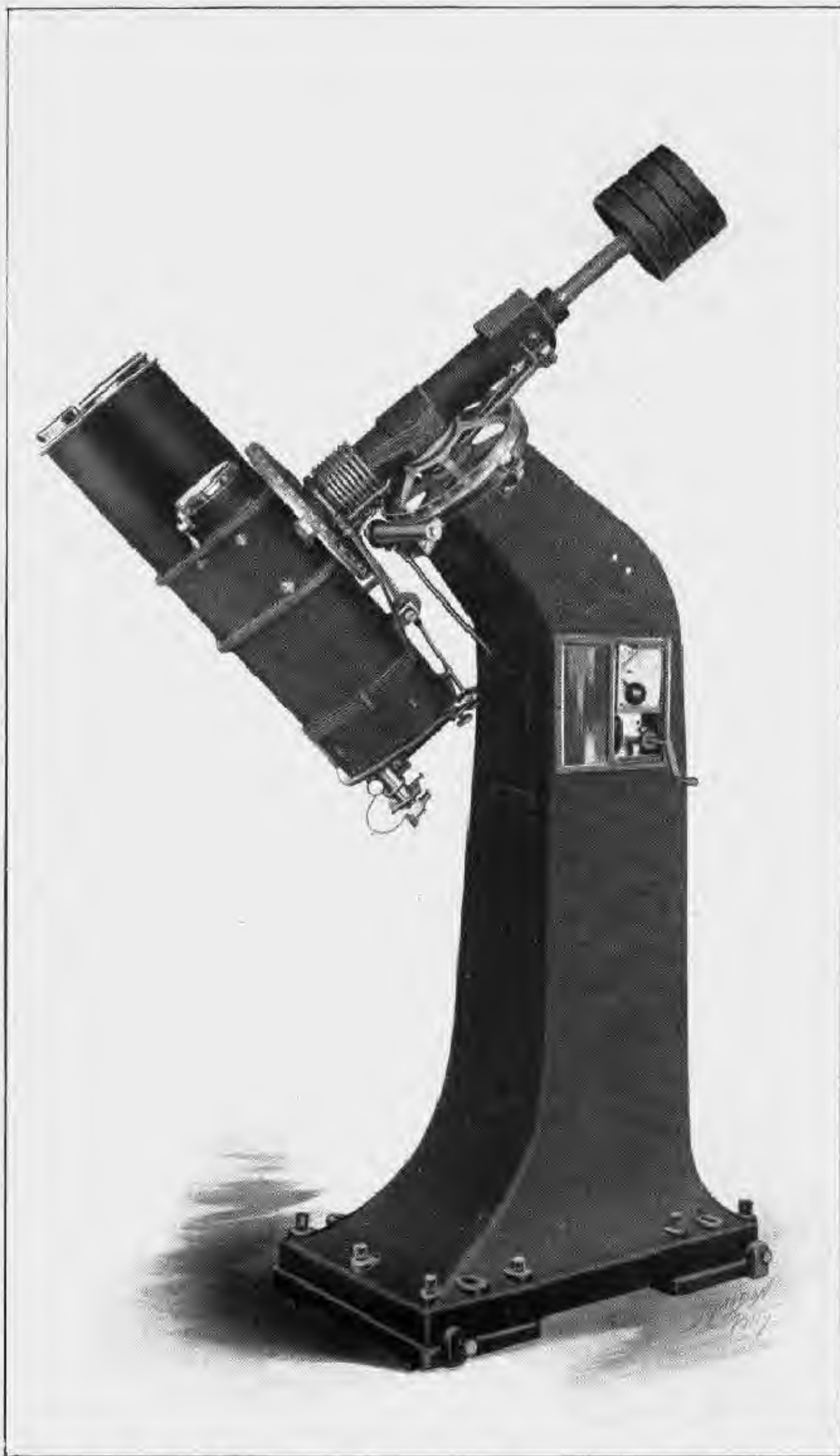
Gratings with length of lines or radius of curvature different from those specified in this list will be given a price proportional to these factors.

These gratings are ruled on Professor Rowland's engine, under the care of the department of physics of the Johns Hopkins University, Baltimore, Maryland. The plates are prepared by the John A. Brashear Co., Ltd., Pittsburgh, Pennsylvania, to whom all communications should be addressed.



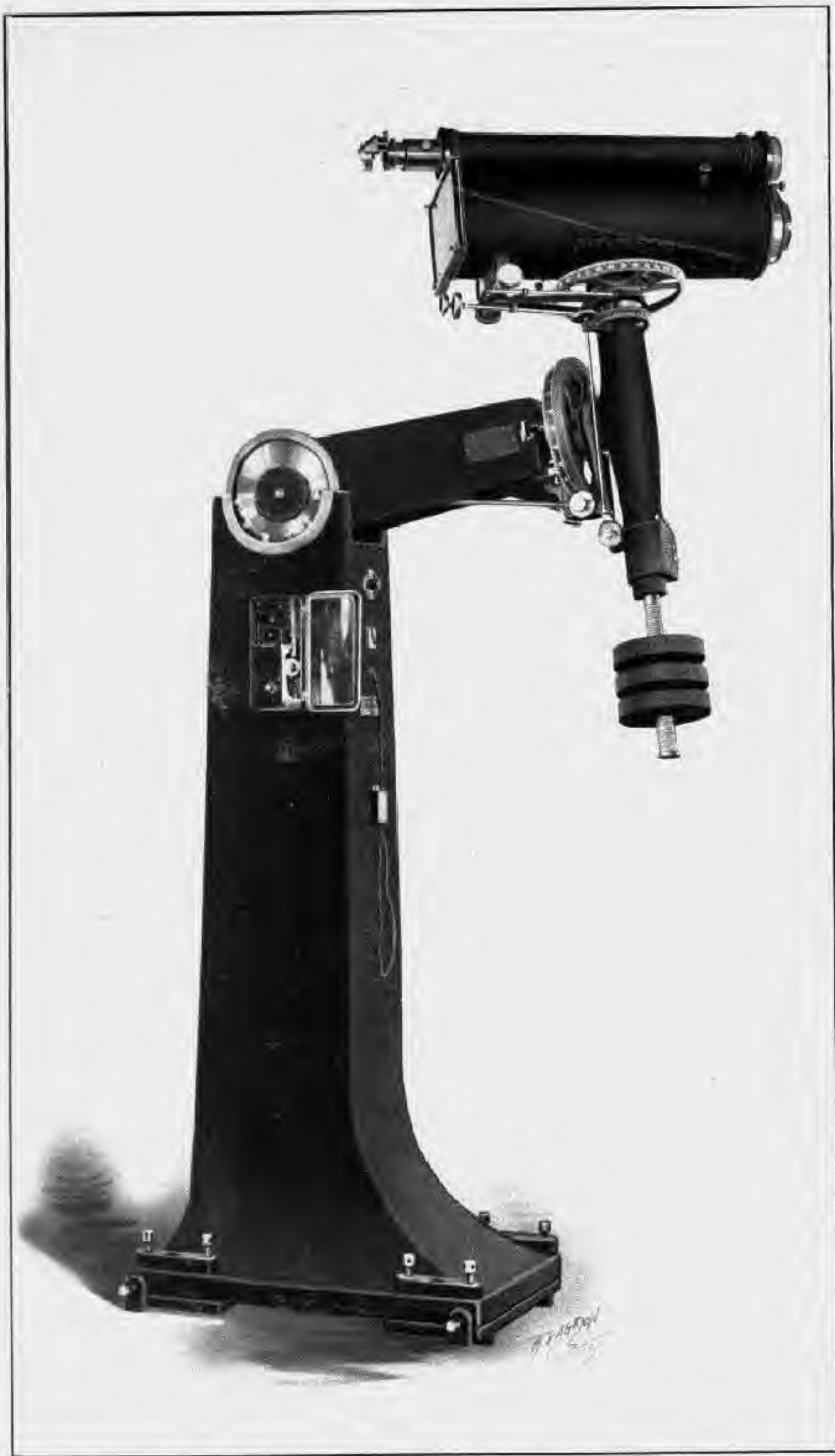


Combined Coelostat and Siderostat.  
One, two or three mirrors may be used if desired.  
Any size up to 40 inches made to order.

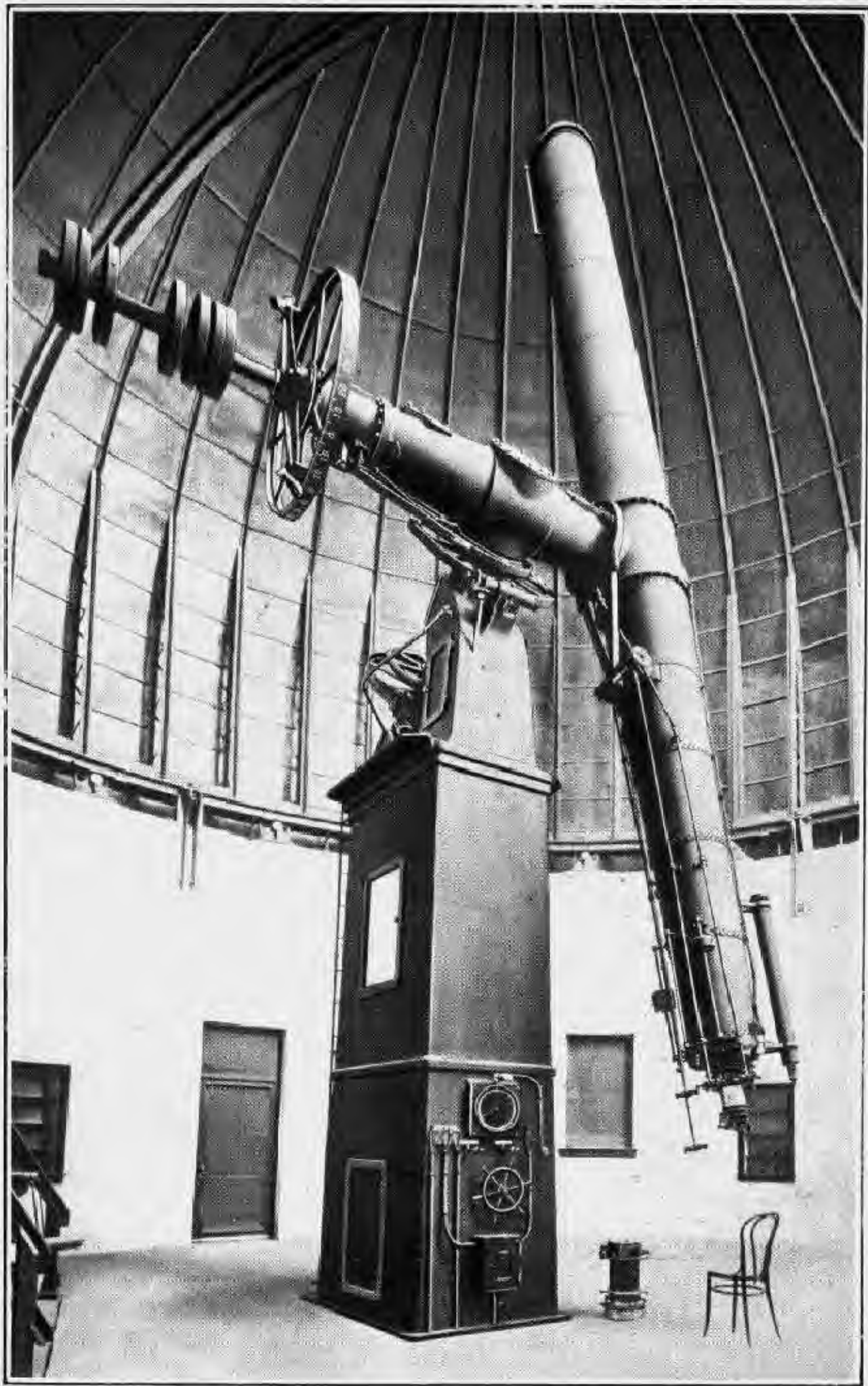


Standard Astronomical Photographic Telescope. Made of any aperture.

Prices given on application.



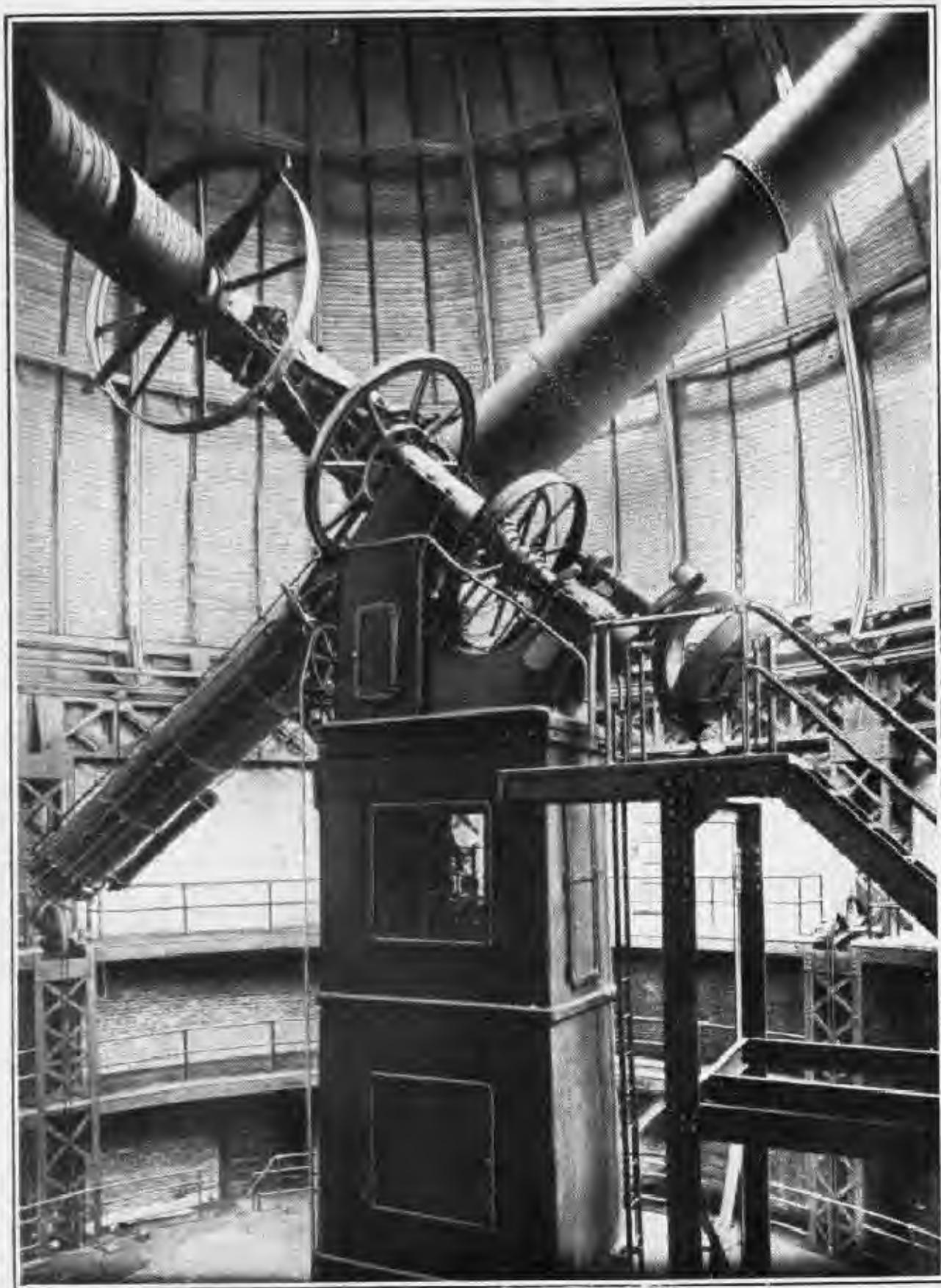
Astronomical Photographic Telescope with Universal Equatorial Mounting.  
May be changed for any latitude North or South of the equator in 15 minutes.  
Prices given on application.



Standard 24-inch Equatorial Telescope.

See note page 16.



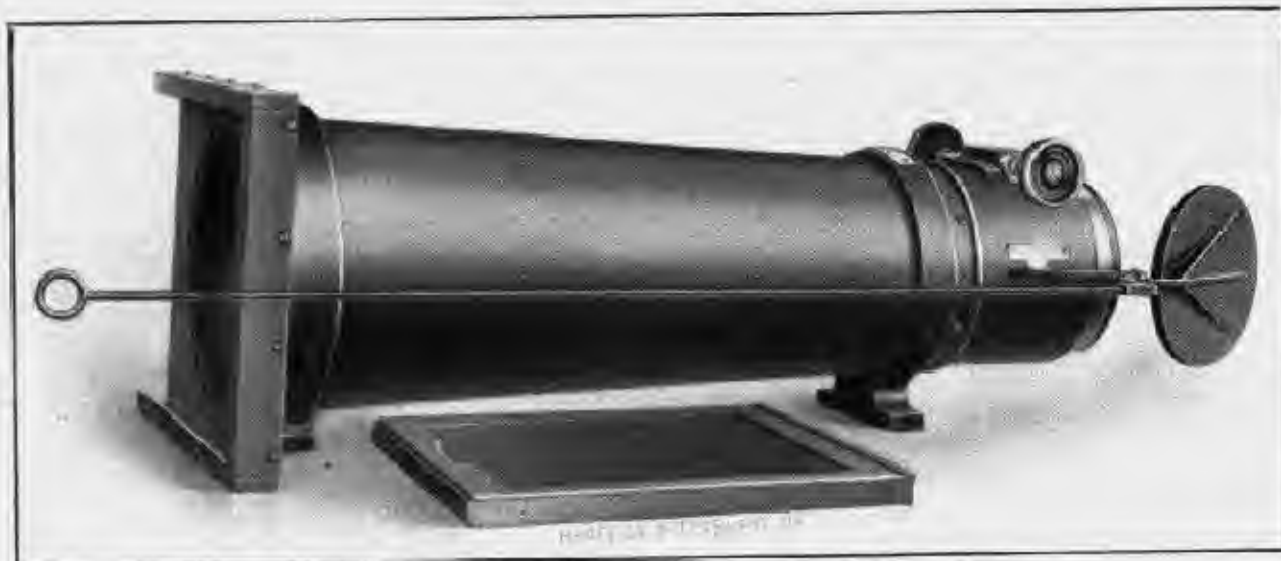


Standard 30-Inch Equatorial Telescope.  
With Heliostat attachment if desired.

See note page 16.



16-Inch Astronomical Camera Objective and Cell.  
Made for Dr. Max Wolf Konigstuhl Observatory, of Heidelberg.  
See page 38.

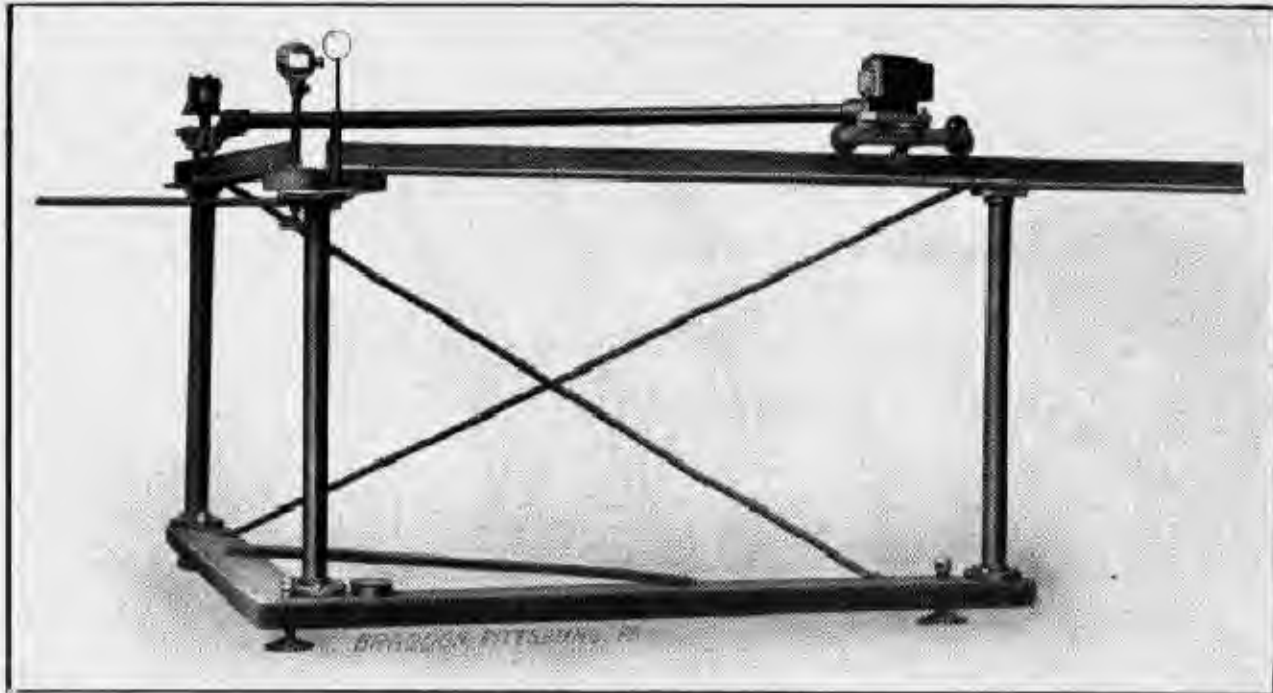


**Photographic Doublets and Cameras  
for Astronomical Photography . . .**

The above engraving shows camera ready for attachment to an equatorial. Special mountings provided when desired.

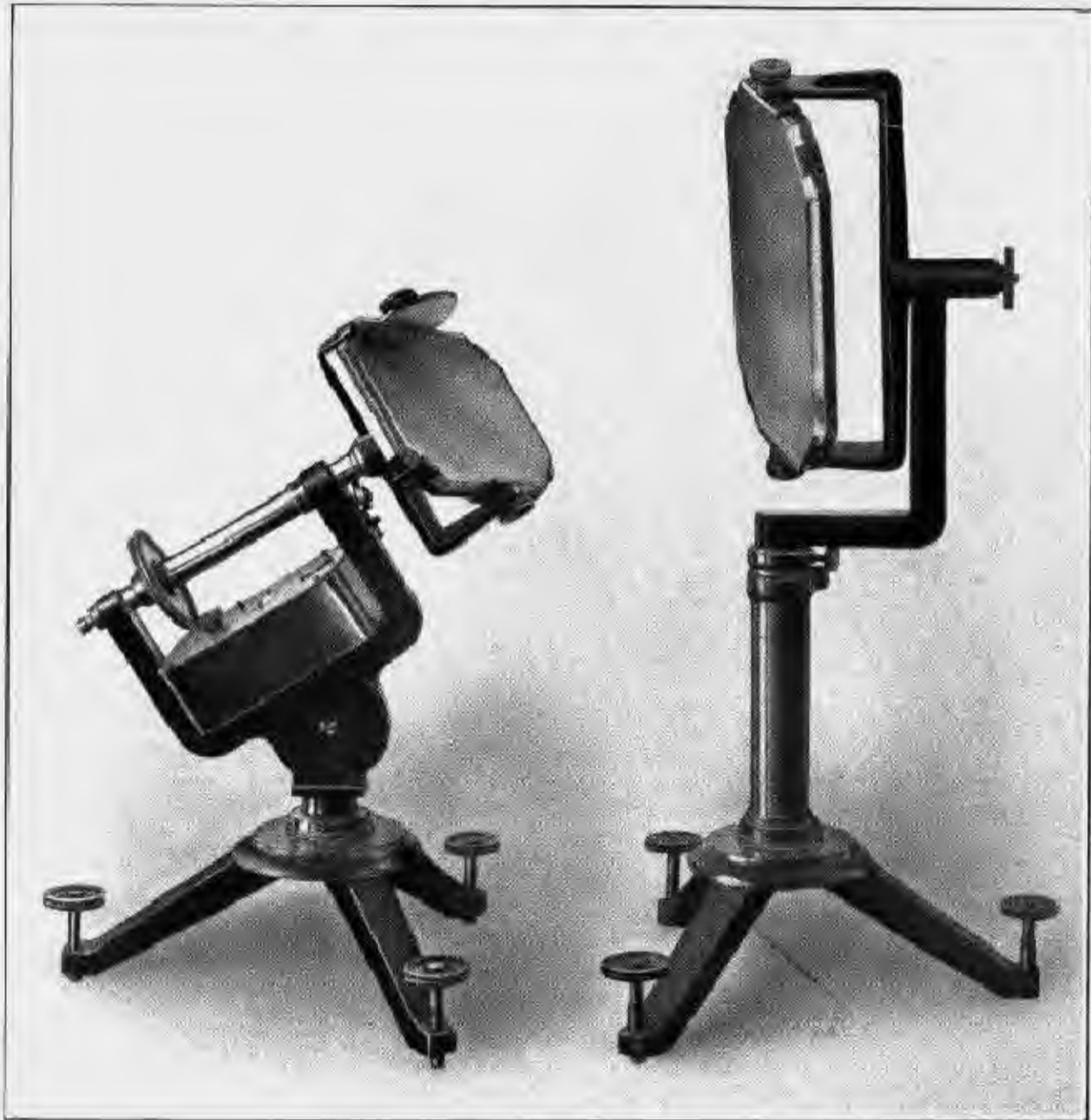
|  |        |
|--|--------|
| 4-inch Objective with camera, complete | \$ 350 |
| 5 " " " " " " " " " " " "              | 500    |
| 6 " " " " " " " " " " " "              | 750    |
| 8 " " " " " " " " " " " "              | 1,400  |
| 10 " " " " " " " " " " " "             | 2,200  |
| 12 " " " " " " " " " " " "             | 4,000  |
| 15 " " " " " " " " " " " "             | 7,800  |

Prices include two metal plate holders.  
Larger sizes made to order.



Standard Type of Nos. 1, 2 and 3 Concave Grating Spectroscope.

The above instrument may be set on the laboratory floor. Nos. 4, 5 and 6 should be mounted on solid masonry piers, or attached to the walls of the laboratory by brackets. See page 40.



Two-Mirror Heliostat,

giving a  $3\frac{1}{2}$ -inch beam; clock work runs eight days without rewinding. A very good heliostat for use with concave grating spectroscope.

See page 40.



## Concave Grating Spectroscopes

Including Rails, Grating, Camera, Eye-piece, Grating Holder, Carriages,  
Quartz Condensing Lens and everything complete, except Micrometer.

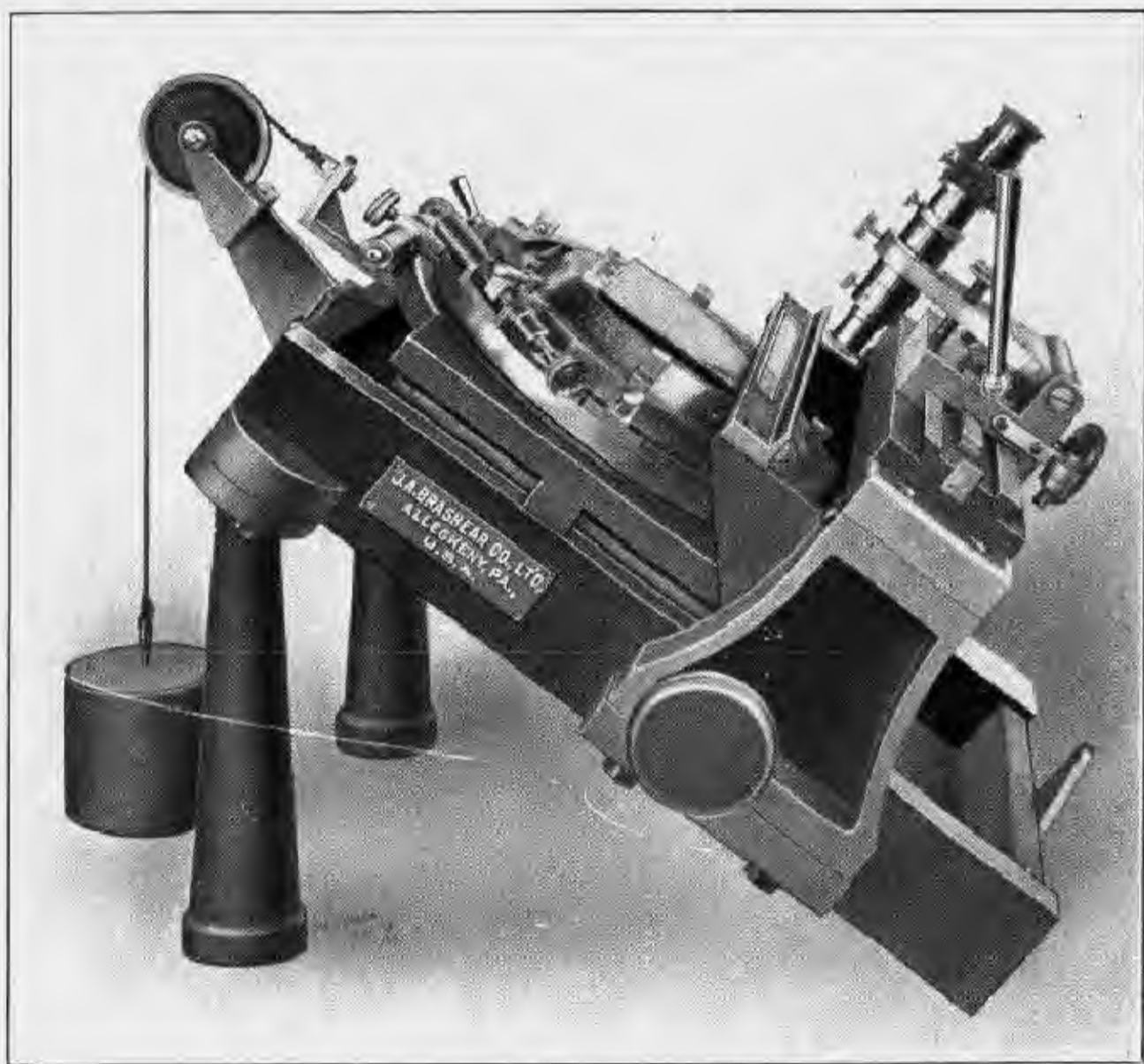
|        |                              |                                      |                    |        |
|--------|------------------------------|--------------------------------------|--------------------|--------|
| No. 1, | 1 $\frac{1}{4}$ -inch plate, | 1 $\frac{1}{8}$ -inch ruled surface, | 4 feet radius..... | \$ 195 |
| " 2,   | 2 " " "                      | 1 $\frac{5}{8}$ " " "                | 5 " " .....        | 220    |
| " 3,   | 2 $\frac{7}{8}$ " " "        | 2 $\frac{1}{8}$ " " "                | 6 " " .....        | 250    |
| " 4,   | 4 " " "                      | 3 $\frac{3}{8}$ " " "                | 10 " " .....       | 550    |
| " 5,   | 5 " " "                      | 4 $\frac{5}{8}$ " " "                | 15 " " .....       | 950    |
| " 6,   | 6 " " "                      | 5 $\frac{1}{2}$ " " "                | 21 " " .....       | 1,150  |

|                                     |               |
|-------------------------------------|---------------|
| Micrometer for Nos. 1, 2 and 3..... | \$35 to \$ 50 |
| " " 4, 5 " 6.....                   | 60 to 100     |
| " " larger sizes.....               | 90 to 150     |

Above prices include iron pedestals and base for Nos. 1, 2 and 3, the larger sizes should be set on piers, or bolted to the walls of the laboratory by brackets.

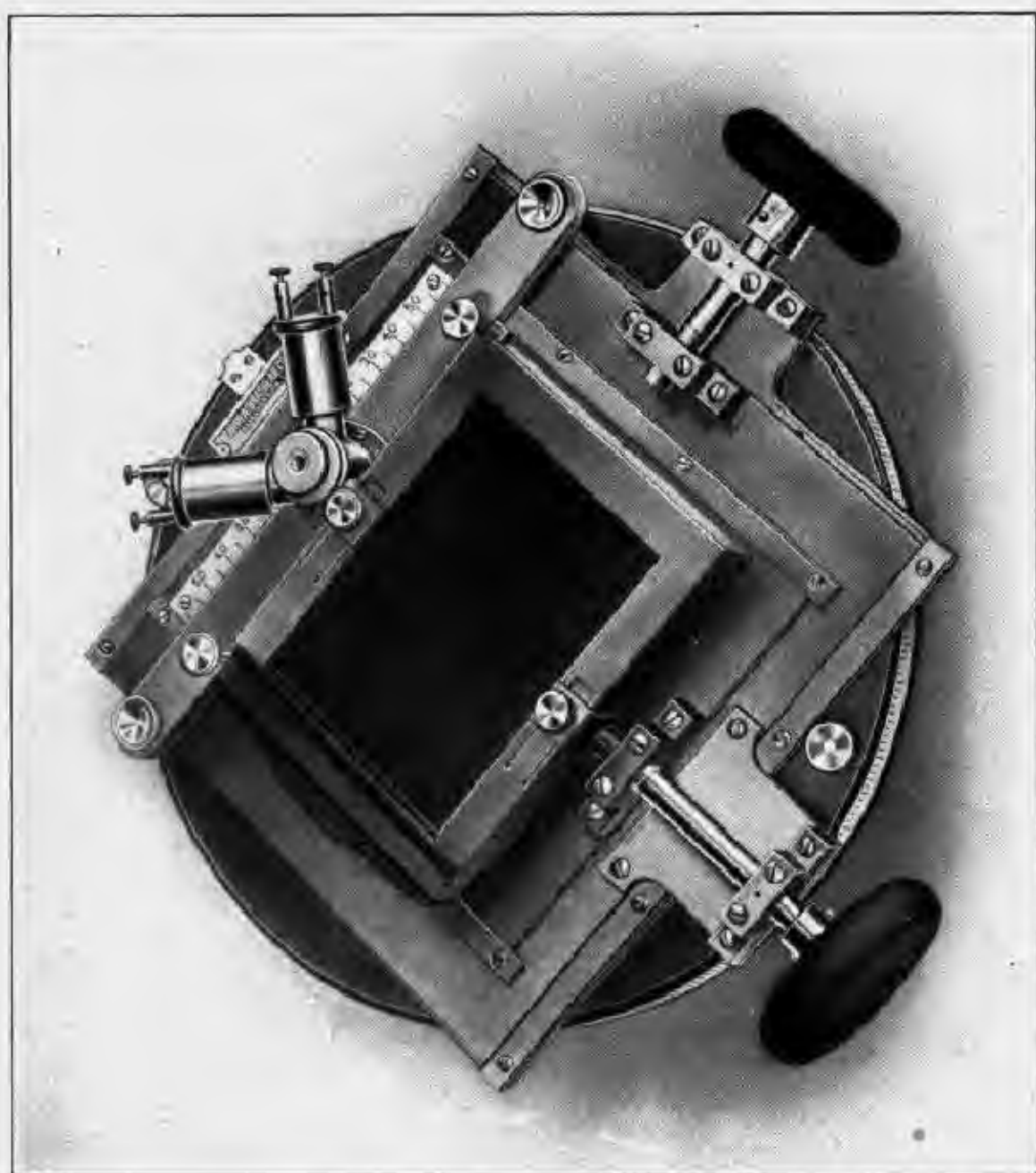
Two-mirror heliostat for use with Concave Grating Spectroscopes giving 3  $\frac{1}{2}$ -inch beam, \$110.

First surface mirrors for same made to order.

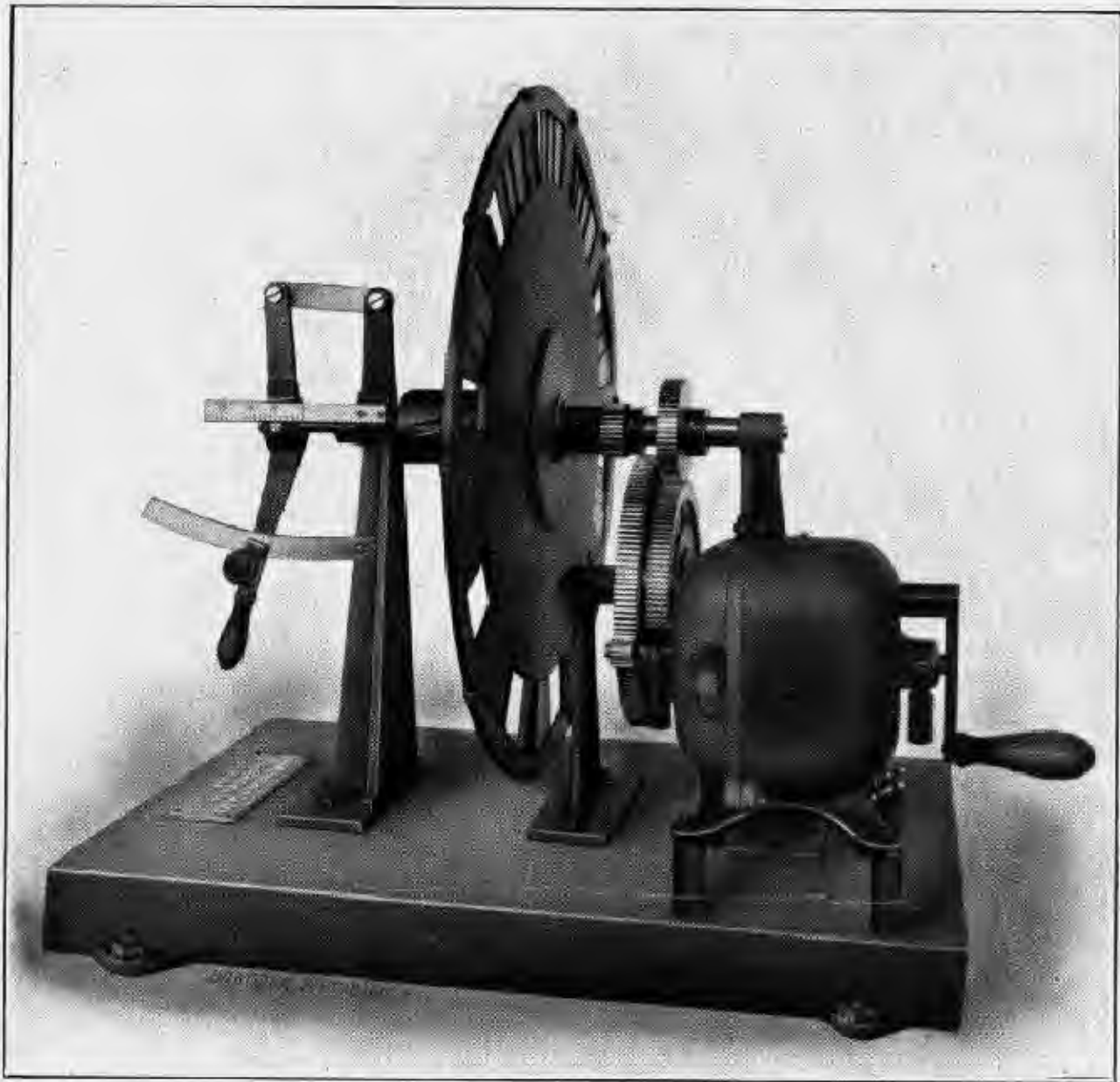


#### Measuring Engine for Stellar Photographs.

Made for any size of plate. These measuring machines are so constructed that all moving parts, plate holders, etc., are made of the same material, so that the coefficient of expansion and contraction will be constant. One surface of each of the bearings is treated by a method that insures a minimum of friction and ease of motion—so difficult to secure when bearings of the same material come together. Prices on application.



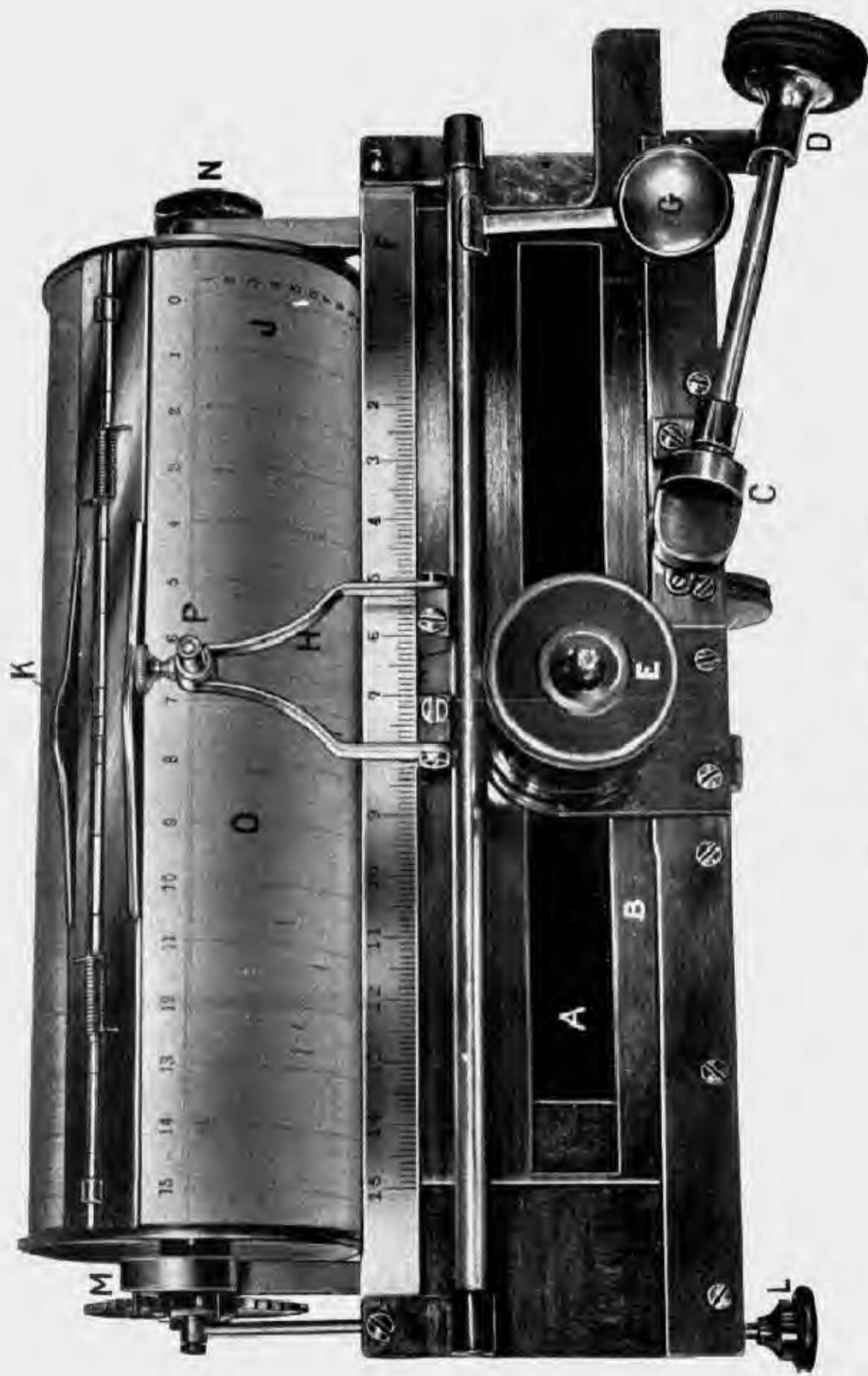
Double Slide Photographic Plate-Holder,  
with slow motion in both co-ordinates. Micrometer eye-piece with electric illumination.  
We construct these plate-holders for any size negative.  
Prices on application.



Disc Photometer.

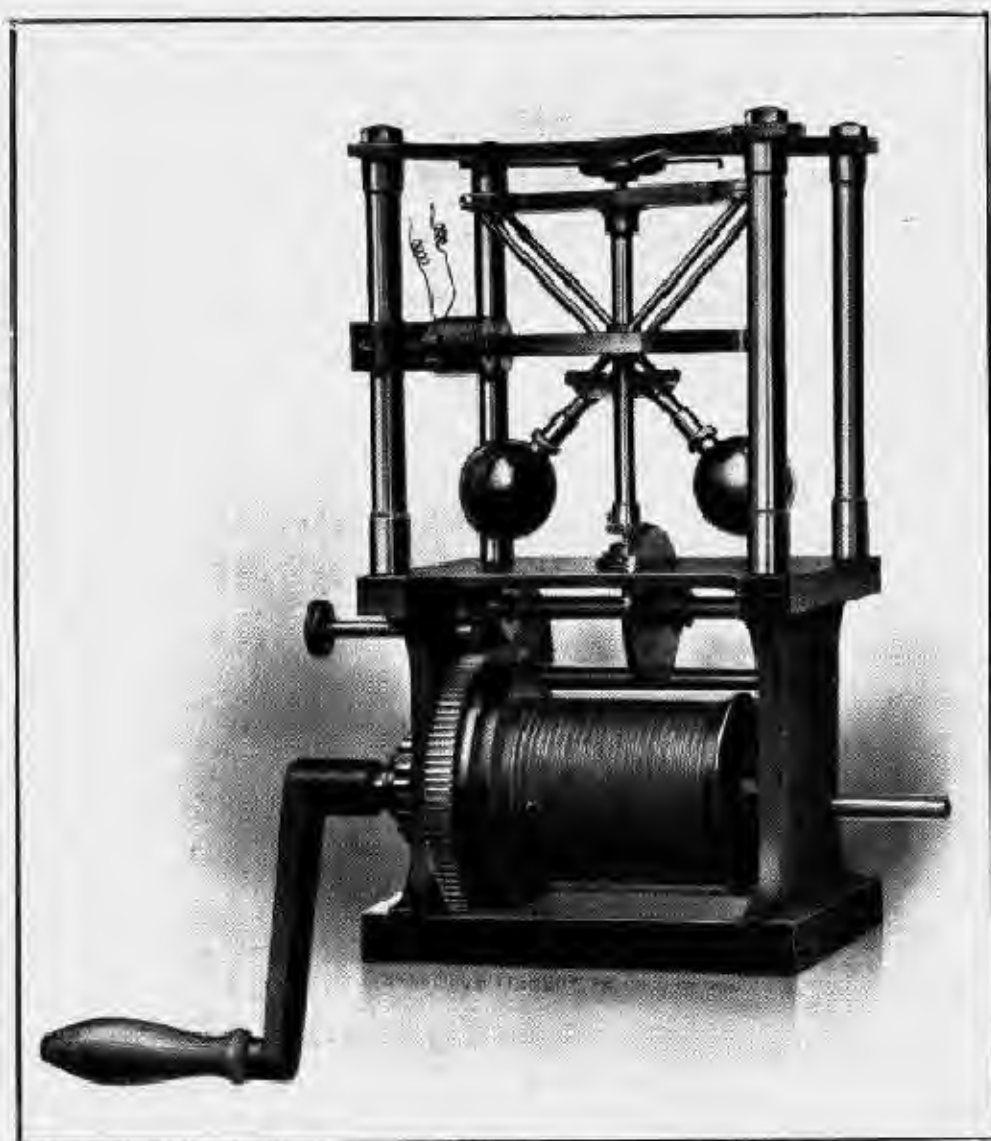
May be driven by hand or electric motor. Sectors may be opened and closed while disc is rotating, and percentages read on scale. Price from \$200 to \$300.



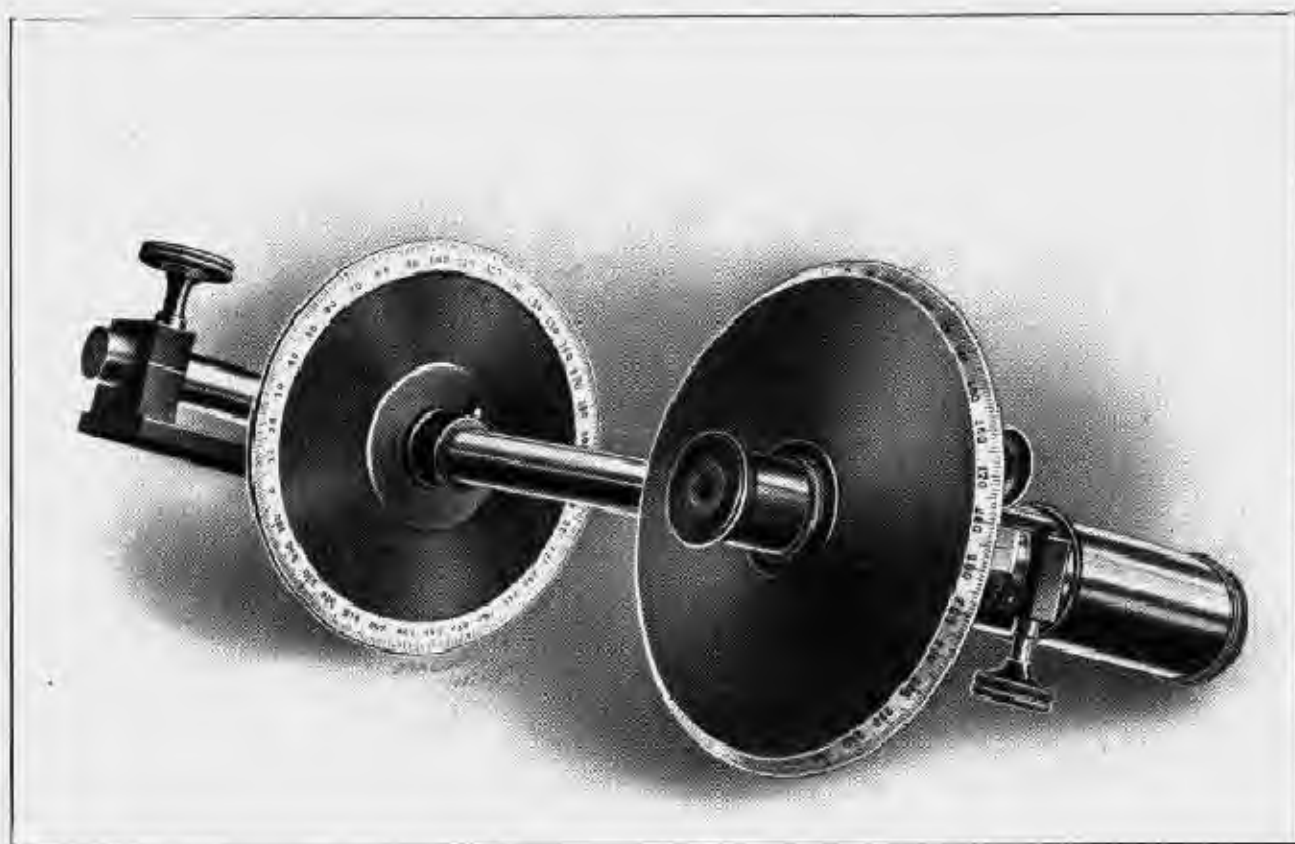


New Form of Wedge Photometer.

By a slight pressure upon the lever G, which actuates the stylus P, a record of the star's relative brightness is recorded on the prepared paper O. Pressure upon the button L moves the drum for the next record. By rotating the milled wheel D the compensated wedge A can be moved until the light of the star is obliterated, and again recorded. 45 records can be made before changing the paper. No artificial light need be used with this photometer, thus keeping the pupillary aperture constant during the time of observation.



Driving Clock. From \$150 to \$600.



Polarimeter. From \$150 to \$200.

**Price List of Eye - Pieces for  
Telescopes, Spectroscopes, Etc.**

|   |        |
|---|--------|
| Standard negative eye-pieces from 0.2-inch to 1.5-inch equivalent<br>focus; each..... | \$5.00 |
| Standard positive eye-pieces from 0.2-inch to 1.5-inch equivalent<br>focus; each..... | 5.00   |

**Higher or lower powers made to order**

|   |                    |
|---|--------------------|
| Wide field Kellner eye-pieces; each.....        | \$ 6.00 to \$18.00 |
| Wide field triple lens eye-pieces " .....       | 7.50 " 25.00       |
| Hastings solid eye-pieces " .....               | 6.50 " 9.00        |
| Herschel solar eye-piece.....                   | 35.00              |
| Polarizing solar eye-piece.....                 | 50.00              |
| Neutral tint sun cap.....                       | 2.00               |
| Diagonal for zenith observation .....           | 15.00              |
| Achromatic pancratic terrestrial eye-piece..... | 25.00              |
| Triple prism terrestrial eye-piece.....         | 35.00              |
| Porro prism terrestrial eye-piece.....          | 35.00              |
| Direct vision spectroscopic eye-piece.....      | 25.00              |

**In addition to the Apparatus noted in this Catalogue, we furnish any of the following accessories:**

### **Eye-Pieces**

Every type of positive or negative eye-piece, Kellner, achromatic, solid, double and triple lens wide field astronomical eye-pieces and prismatic terrestrial or erecting eye-pieces, also many other forms for special purposes.

### **Prisms**

Objective prisms, composite prisms, crown and flint glass prisms of any angle or form, quartz, spar and rocksalt prisms, Rochon and Wollaston double image prisms.

We also make several forms of erecting and reversing prisms.

### **Refractometer and Sextant Mirrors**

Refractometer and sextant mirrors of a high degree of accuracy. Other plane parallel mirrors for special purposes corrected to within one twentieth light wave if desired. Parallel shade glasses for use in observing the sun. Compensated dark wedges for photometric or solar observations.

### **Speculum Metal Mirrors**

Plane, spherical or parabolic mirrors of speculum metal made to order.



### Special Apparatus

We are prepared to construct special apparatus of almost any kind required in the domain of physics, optics, horology, etc., and invite correspondence upon the same.

Photographs or engravings of Blink Microscopes, Pickering Photometers large plate Measuring engines or other special apparatus made by us furnished with pleasure.

### Domes for Astronomical Observatories

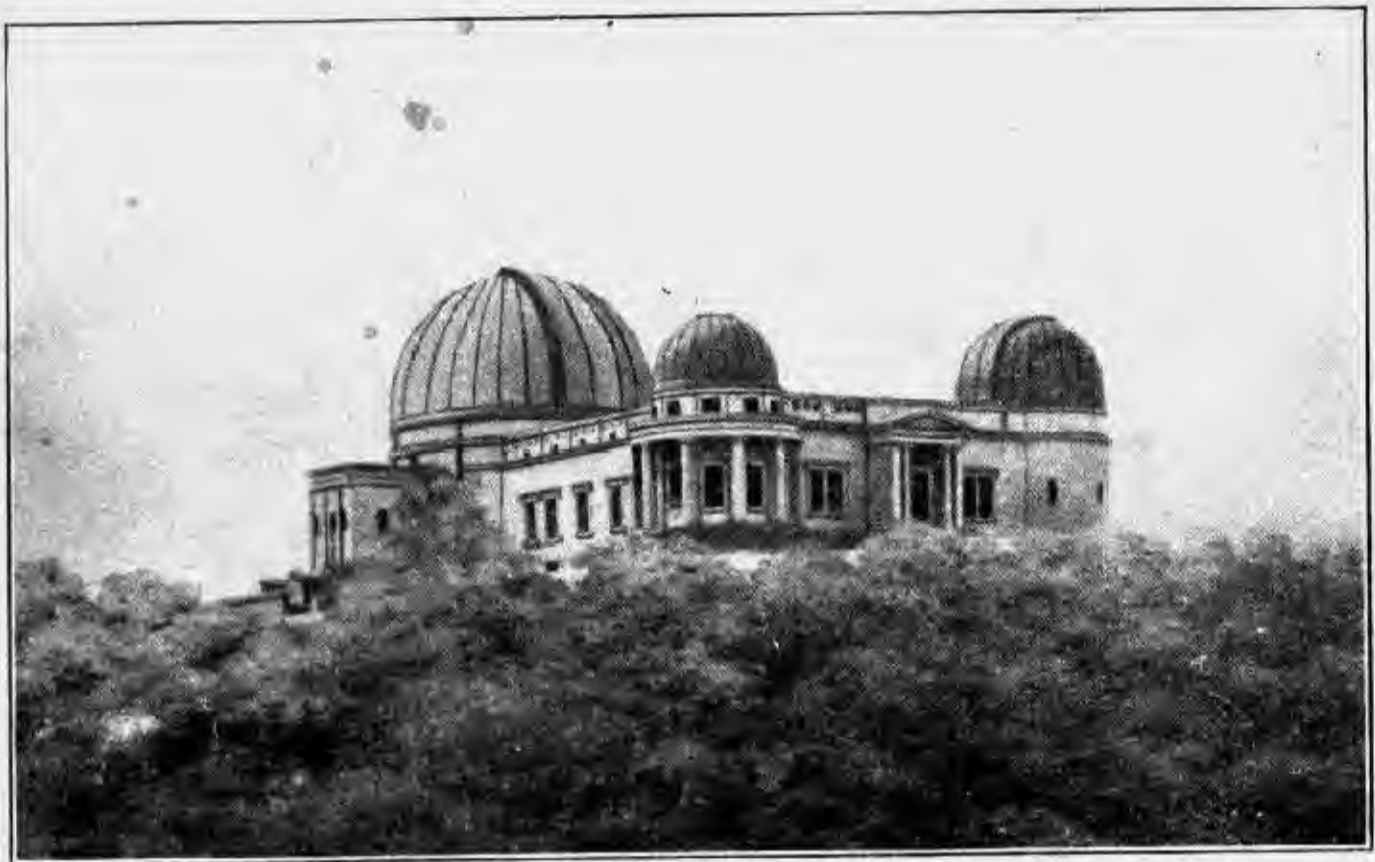
We furnish the running gear for small domes, say from 15 to 20 feet diameter, with blueprints of a simple construction so as to enable any good mechanic to build an observatory.

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Contracts for domes of the largest dimensions can be made through our company.



Murdoch, Kerr & Co.  
Pittsburgh



The New Allegheny Observatory